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SOME ASPECTS OF METAMEMORY IN RETARDED ADULTS

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(C) BRIAN JAYAWARDHANA

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "Some Aspects of Metamemory in Retarded Adults" submitted by Brian Jayawardhana in partial fulfilment of the requirements for the degree of Master of Education.

ABSTRACT

Although good memory is a requirement for efficient functioning it has been found to be lacking in mentally retarded persons who are being trained to live independently. Metamemory, or the awareness of the workings of one's memory, has been suggested as the key to good memory performance. For this reason, the main purpose of this study was to investigate metamemory in mentally retarded adults, namely, to what extent it was present in this population and what relationship it bore to measures of memory performance, intelligence and adaptive behaviours.

The thirty subjects in the study had no brain damage and were between the ages of 21 and 46 with a mean age of 28.37 and a standard deviation of 6.74. Their I.Q.'s ranged from 43 to 81 with a mean of 62.2 and a standard deviation of 10.2. There were 20 males and 10 females. The selection was based on the subject's ability to understand basic questions and the availability of scores of I.Q. and adaptive behavior.

Metamemory was measured by using a very slightly adapted version of the fourteen - item questionnaire used by Kreutzer, Leonard and Flavell in 1975. It is the most comprehensive measure of metamemory developed so far. Each interview, which took approximately forty-five minutes, was

recorded on tape. As a group, the subjects showed metamemory in all the areas that were examined.

Memory tests based on six of the metamemory questions were designed to measure memory performance. The mean score for the subjects was relatively high (just over 63 per cent) and three fourths of the correlations between tests were significant. Although memory tests did not correlate significantly with task-specific areas of metamemory in most cases, the aggregate score for the metamemory questions correlated significantly and substantially with the aggregate score for the memory tests. When scores above and below the mean were subjected to a contingency table, 13 of the 16 subjects who scored high in memory were found to have scored high in metamemory as well.

Measures of Full-Scale I.Q. Verbal I.Q. and Performance I.Q. were obtained using the Wechsler Adult Intelligence Scale. The subjects were divided into three groups of ten each according to Full-Scale I.Q. A one-way analysis of variance indicated that metamemory increased with I.Q. as did memory performance.

Four measures of adaptive behavior were taken. Two of these namely, Self-Help Skills and Community Awareness, correlated significantly with metamemory.

A second purpose of the study was to determine the best predictors of memory performance and community awareness from General Metamemory, Specific Metamemory,

Full-Scale I.Q., Verbal I.Q., Performance I.Q., and Digit Span. These two items were selected because they were of considerable importance to people being trained to live independently.

General Metamemory (aggregate score for all fourteen metamemory questions) was found to be the best predictor of memory performance while Full-Scale I.Q. came out as the next best predictor. Together, they accounted for 52 per cent of its variance.

Verbal I.Q. was found to be the best predictor of Community Awareness while General Metamemory came out as the next best predictor. Together, they accounted for 54 per cent of the variance.

Thus, it was found that metamemory awareness in all of the areas examined exists to a fair extent among mentally retarded adults. It was also found that General Metamemory as opposed to task-specific aspects of it, is responsible for considerable parts of the variance of both memory performance and community awareness. Those with higher I.Q.'s had greater metamemory awareness. Metamemory seems to mediate between intelligence and memory performance supplying the subject with various options for the exercise of executive control.

The practical implication drawn is that the teaching of metamemory (abstract knowledge about memory) should be an integral part of any program designed to enhance the memory

of retarded persons. This in turn may improve skills for independent living.

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I dedicate this work to the memory of my parents. Without the discipline that they lovingly taught me, I would never have achieved this goal.

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CHAPTER 1

INTRODUCTION

It has been seen from several studies that the memory performance of mentally retarded persons is poor (Kail, 1979). This is unfortunate since memory is a requirement for independent living and many mentally retarded persons have been brought out of institutions and are being trained to live on their own. Without memory for personal routines, the names of people and places, and numerous other specific objects they would experience many difficulties.

Over the years, many researchers have tried to identify the reasons for the poor memory performance of younger normal children and retarded persons. Memory deficiencies have usually been blamed on the lack of spontaneous use of mnemonic strategies (Ellis, 1970; Brown, 1978). However, it is known that retarded individuals may be taught to use strategies, at least for a limited length of time, with consequent improvement in memory performance (Butterfield, Wambold and Belmont, 1973; Ashcraft and Kellas, 1974). Even with no deliberate intentions to memorize, retarded persons remember better when induced to process information either phonemically or semantically (Lupart, 1978; Jayawardhana, 1981). However, left to their own resources, the retarded fall back to their inefficient ways of remembering (Brown, 1974).

Individual differences in memory performance exist even within populations of normal subjects. Even with the motivation to learn, some cannot remember things in the way that they would like to. In the earlier days of memory research, this poor memory was blamed on individual differences in structure (Broadbent, 1958). Today, however, there is a growing emphasis on process (e.g. Bjork, 1975; Craik and Lockhart, 1972) as opposed to limitations of structure, and poor memory has been attributed by some (e.g. Flavell, 1971, Brown, 1975) to a lack of awareness of the workings of one's memory ("metamemory").

For these reasons, the main purpose of the present study is to examine metamemory in retarded adults who are being trained to live independently in the community. This population has been relatively neglected in memory and metamemory research. This research will seek to determine to what extent metamemory exists among this population and how it relates to measures of memory, intelligence, and adaptive behavior. Since both memory and community awareness are very important for independent living, this study will also attempt to determine the best predictors of these two items in order to derive some practical implications for the habilitation of retarded adults.

The next chapter will contain a review of selections of the research literature on metamemory and memory in order to specify directions for the present research. The third chapter will provide a rationale for the design of the

present study and also indicate the method and expected results. The subsequent chapters will present the results of the study, a discussion of the results in the light of previous findings, and the limitations of this study along with directions for future research in the field. The final chapter will recapitulate the entire paper and highlight the main findings and practical implications.

CHAPTER 2

SELECTIVE REVIEW OF LITERATURE

In order to design specific experiments that would help to achieve the purposes of this study it is necessary to examine the research that has already been conducted in this area. The literature will be reviewed in three sections. The first section will provide a brief overview of the research on memory and the second section will cover the investigations of metamemory in general. The third section will survey studies of memory and metamemory in retarded subjects.

A. Memory

Memory has been represented by various models. In order to facilitate a clearer understanding of the terms used in the research reviewed later, a brief description of the models will be given here. The earlier model of memory, namely, the multi-store model, was used as a basis for research for over half a century and this will be described first.

1. The Multi-Store Model of Memory:

Theories distinguishing between two kinds of memory were proposed by the eighteenth century English Associationists, James Mill and John Stuart Mill, and by early

experimental psychologists like Wilhelm Wundt and William James (Atkinson and Shiffrin, 1971). With the advent of Behaviourism, the concept was discarded. However, it was revived in the 1950's by Broadbent, Hebb, and Miller. In 1958, Broadbent proposed a "box" model of memory which was subsequently elaborated and modified by several authors, chief among whom were Waugh and Norman (1965) and Atkinson and Shiffrin (1968, 1971).

Waugh and Norman (1965) proposed a double-store model. Every item that is attended to enters 'Primary Memory'. The capacity of this store is sharply limited, and new items displace old ones which are permanently lost. If an item is rehearsed (repeated), however, it remains in Primary Memory or may enter 'Secondary Memory' where it endures more permanently.

The model proposed by Atkinson and Shiffrin was influenced by mathematical psychology and computers. Memory is seen as being comprised of permanent "structures" and readily modifiable "control processes" (Atkinson and Shiffrin, 1968). Memory structures include both physical features and built-in processes that are not under the subject's control. The three structures are Sensory Register in which incoming stimuli are registered according to sensory dimensions, Short-term or "Working Memory" in which items remain for a short length of time, and Long-term memory. Short- and Long-term memory are not necessarily in different

parts of the brain. Short-term Memory may be considered a temporary activation of Long-term memory. Transfer of information from one store to another is not transposition but copying, so that a copy would exist in each store until it it lost by decay. Control processes are used by the learner to encode, retain and retrieve information. Specific control processes are associated with different stores.

Other versions of the multi-store model were modifications of the two described above. One of the more significant modifications was the one proposed by Bjork (1975). In this model, the control processes are separated from the various stores and centralized.

What is of note in the evolution of the models with stores is the growing emphasis on the learner as being responsible for the processes. Although the idea of structures and the image of several discrete compartments continue to appeal to many investigators, there is an increasing focussing of attention on process, as the next model typifies.

2. <u>The Levels-of-Processing Model of Memory</u>:

Craik and Lockhart (1972) found the multi-store model of memory to be inadequate when looked at closely from the points of view of capacity, the way in which material is coded, and the rate of item loss, the three factors that were supposed to distinguish between stores. There was considerable overlap and variation of these factors. Due to the

lack of clarity regarding the distinctiveness of the stores, and considering the fact that it is the processes that really affect retention, regardless of where they are supposed to be located, Craik and Lockhart suggested that the duration of a memory trace would be dependent on the "depth" or "level" at which the incoming material was processed. The first or most superficial level at which material may be processed is attendance to the physical features (e.g. colour) alone. If attention was paid to the sound or phonemic qualities of the materials, the processing was considered to take place at a deeper level. The deepest level of processing was that dealing with the meaning or semantic content of the material. The deeper the processing, the more durable would be the memory trace.

Craik and Lockhart also distinguished between two types of rehearsal or processing. In Type I processing, the learner merely re-circulates information through his mind at a given depth of analysis (e.g. the phonemic level). In Type II processing, the analysis is carried out to progressively deeper levels.

The above model has been supported by subsequent research (Craik and Tulving, 1975). Although Craik and Lockhart claim that theirs is not a theory of memory but only a useful framework for research, a large body of both theory and research has been built around it (Cermak and Craik, 1978).

While the models of memory described above are based on the findings as to how memory functions in normal adults, they do not indicate how memory develops from birth to adulthood. Since the memory functioning of retarded individuals is at a lower stage of development than that of normal adults, a quick review of memory development will be relevant to this study.

1. Memory Development

The earliest type of memory displayed by children is recognition memory (Kail, 1979). Unlike in the case of recall, this type of memory requires minimal use of strategies.

Normal children start to use rehearsal with regularity around the age of seven (Flavell, Beach and Chinsky, 1966) but do not organize the material to be studied into categories until they are about thirteen (Ornstein, Naus and Liberty, 1975). Although children younger than seven cannot be induced to use rehearsal through repeated practice (Glidden, 1977), five-year-olds can be taught to use strategies in memory tasks (Kingsley and Hagen, 1969) even if they are not maintained without prompts (Keeney, Cannizzo and Flavell, 1967).

Although the memory performances of children differ according to age, the average adult generally uses strategies according to the demands of different memory tasks. However,

it is known that persons of the same age and level of intelligence perform differently (Kail, 1979). It has been suggested by some researchers (Flavell, 1971; Brown, 1975) that the differences in memory performance are functions of different degrees of memory awareness or "metamemory". For this reason, the section that follows will examine this construct.

B. Metamemory

The word "metamemory" was coined by Flavell (1971). At that time he cited examples from research to suggest that memory development was an aspect of general cognitive development during the course of which people start acting planfully. An aspect of this total development, according to Flavell, is the awareness that a person has of himself as a memorizer. It is this awareness that constitutes metamemory.

Six years later, Flavell, along with Wellman (Flavell and Wellman, 1977) further developed the concept of metamemory based on a survey of the research conducted in the area. The authors suggested that four broad, partially overlapping phenomena were connected with memory growth. The first of these comprised the basic operations and processes of the memory system. The second consisted of the effects of one's cognitive development on memory, while the third consisted of the various strategies used by a learner to aid memory. The fourth phenomenon was metamemory which the

authors now defined as a person's VERBALIZABLE knowledge about memory. Although unsure as to the total and exact content of this knowledge about memory, the authors tentatively suggested two main areas. The first area consists of a person's awareness that some tasks require planful memory-related efforts while other tasks do not. The second area consists of a person's awareness of three variables that affect memory functioning, together with a knowledge of how these variables interact. These three variables are: (1) memory-related characteristics of the person himself, (2) memory-relevant aspects of the task, and (3) potentially employable strategies.

The "person variable" is comprised of two types of knowledge. The first type concerns the present here-and-now awareness that a person has about the state of items in his memory. For example, he may be aware that a certain item is in his memory although he cannot quite recall it now. The second type of knowledge deals with the enduring traits and capabilities of the person as a memorizer. For example, he may know that he is usually capable of remembering a maximum of six items for a period of four months.

The "task variable" too is comprised of two forms of knowledge. The first concerns a learner's awareness of the difficulty or ease of the demands of a particular memory task. For example, does he know that recognition is easier than recall, or that the recall of the gist of a story is

easier than recalling it word for word? The second concerns the materials to be recalled. For example, some types of materials are easier to recall than other types. Also, regardless of the type of material, fewer things are easier to recall than a larger number of things.

The "strategy variable" includes all types of deliberate actions on the part of a person during both encoding and retrieval of information. These strategies may be internal, such as the categorization of items during study, or external, such as the writing of notes as an aid to memory.

The most advanced form of metamemorial knowledge, according to Flavell and Wellman, is an awareness of the way in which the above variables interact in any given memory task. The materials to be learned and the demands of the task constitute the "obstacles" while the personal skills and available strategies constitute the "resources" of the task. A person with superior metamemory will know how to balance the resources with the obstacles in order to be able to perform the task optimally. Thus metamemory seems to be a form of abstract knowledge providing the subject with a certain flexibility and freedom in the way he approaches a memory task.

In the pages that follow, selected findings of research in the areas of metamemory mentioned above will be examined. The first section will concern the awareness that a person has that a particular task demands special mnemonic efforts. The next three sections will review research on the three

variables while the fifth section will examine research dealing with the interplay of these variables. The sixth section will deal with the relationship between memory and metamemory.

1. Awareness of the Need to Memorize Deliberately

The most basic area of metamemory is the awareness that certain tasks require deliberate efforts to remember (Flavell and Wellman, 1977). Even more basic to this is the understanding of the concept, "remember". It has been found that although fifth-graders, and a few first-graders too, under certain circumstances, act differently under "remember" and "look" instructions, pre-schoolers do not do so (Appel, Cooper, McCarrel, Sims-Knight, Yussen and Flavell, 1972).

2. Memory-relevant Characteristics of Learner

One of the earliest metamemorial topics to recieve the attention of psychologists was the "tip-of-the-tongue" phenomenon. William James spoke of it as early as 1893 (Brown and McNeill, 1966). It occurs when one is aware that one knows a certain item and is on the verge of recalling it. In the meantime, he is capable of supplying numerous items of information about it such as the number of syllables, the first letter, the place of stress, etc. Brown and McNeill found that subjects who eventually recalled a target word prior to being prompted were more accurate than those who did not recall, regarding information about the word.

Even when not experiencing the "tip-of-the-tongue" state, people are usually capable of monitoring the contents of their memories and predicting the subsequent recognition of items after they have failed to recall them, and they do so with above-chance success for both words and pictures (Hart, 1965, 1966, 1967a, 1967b; Blake, 1973; Wellman, 1977). Wellman also discovered developmental trends, not only in the ability to predict the recognition of pictures accurately, but also in the use of strategies to aid such a prediction.

Besides being aware of what may be subsequently recognized, a person can also be aware of his readiness to recall something after having studied it. Children as young as six years are capable of this (Flavell, Friedrichs and Hoyt, 1970). Practice with the same list of items can also enhance this ability as a result of the subject knowing which items on a list have already been recalled on a previous trial (King, Zechmeister and Shaghnessy, 1980). This ability to monitor what has already been recalled, develops with age (Moynahan, 1976).

It has been shown above that memory-monitoring is not restricted to items in active memory but also to those items that are temporarily not in it. Further, this ability to monitor develops with age, and, as Hart (1965) hoped, injects an element of efficiency into our fallible memories, because, as Wellman, (1977) observed, it would enable a person to know whether to search, when to terminate search, what strategy to use, when to modify a strategy etc.

Memory-monitoring is only one aspect of the memory-relevant characteristics of a person. The other aspect is a person's knowledge of his enduring mnemonic abilities. One aspect of this is the knowledge of the length of one's memory span and this develops with age (Flavell, Friedrichs and Hoyt, 1970). The supplying of peer norms helps eight-year-olds but not four-year-olds or adults, to improve the estimation of their memory spans (Yussen and Levy, 1975).

3. Memory-relevant Characteristics of the Task

As mentioned earlier, the "task variable" of metamemory may concern the demands of the task itself, or the memorizability of the materials.

In a study with young normal children, Kreutzer, Leonard and Flavell (1975) found that even kindergartners display knowledge in several areas but that this knowledge is better in older children. The areas are the following:

- immediate recall is easier than delayed recall
- more study-time facilitates learning for recall
- subsequent learning of similar lists may confuse or make one forget.
- recalling the gist of a story is easier than recalling it by rote.
- lists previously studied and forgotten are easier to learn than new lists.
- words woven into a story are easier to recall than those merely presented in a list.

- coloured pictures are easier to recall than black and white ones (no age differences for this item)
- pairs of opposites such as "Black-White" are easier to recall in a cued condition than arbitrary pairs such as "Mary-Walk"
- it is easier remembering a smaller quantity of items

There is also a development trend in a child's awareness that categorizable materials are easier to remember than items that cannot be categorized (Moynahan, 1973).

4. Mnemonic Strategies

In an earlier section, it was seen how children start using the simple strategy of rehearsal without prompts around the age of seven, and how older children use more sophisticated strategies. In this section, the focus will be on the awareness of potential strategies and not merely on their actual use.

Although Ornstein, Naus and Liberty (1975) found in their study that children did not start categorizing items spontaneously until they were about thirteen years old, Kreutzer and her colleagues (1975) as well as Moynahan (1973) found that even third-graders were aware of the greater facility of studying categorized material. Neimark Slotnick and Ulrich (1971), however, found that this awareness was not present until grade four.

A helpful strategy to use in the learning of lists is to spend more time on the items that have not already been

memorized or recalled on an earlier trial. Developmental changes have been found in the awareness of the usefulness of this strategy. (Neimark et al., 1971; Masur, McIntyre and Flavell, 1973).

So far we have looked at the awareness of specific strategies. It is more helpful to know that one has many strategies at one's disposal. Even kindergartners displayed a wide variety of strategies in order to solve many practical memory problems (Kreutzer et al. 1975). In the light of this, it was strange to find that graduate students did not vary their strategies much under the different expectations of an immediate or delayed test (Shaughnessy, 1981).

When it comes to choosing from a range of strategies in a deliberate means-ends line of action, a developmental trend is observable once again (Kreutzer et al. 1975).

Looking back at the research reviewed in this section, it is possible to say that even kindergartners are aware of mnemonic strategies that may potentially be used in different memory situations. However, as Kreutzer and her colleagues note, younger children develop strategies for external search probably before they develop strategies for internal search. By the time children are in fifth grade, they have acquired a fairly wide repertoire of strategies which they use in a conscious and deliberate effort to remember things.

With the current emphasis in memory theory being on the executive role of the learner (e.g. Lawson, 1978), the

strategy variable may be the most critical among the metamemory variables. However, as Flavell and Wellman (1977) have noted, the highest form of metamemory is knowledge about how the different variables interact. This aspect will be reviewed next.

5. Interaction of Metamemory Variables

The factors that could vary in a given memory problem may all be from the same category (e.g. person variables) or from different categories (e.g. person and task variables). In an experiment in which different task variables were made to vary, Wellman (1978) found that although ten-year-olds were capable of taking more than one variable into account, five-year-olds were capable of attending to only one variable.

The research on metamemory reviewed above, as well as research on memory performance (e.g. Kail, 1979) indicate that both memory and metamemory develop with age. Since these are related constructs, it is possible that they be correlated. If one person knows more about the workings of his memory than another, is it not reasonable to expect the former to perform better than the latter at a memory test? The section that follows reviews research attempts to investigate a possible correlation between memory and metamemory.

6. <u>Relationship Between Memory and Metamemory</u>

Although some of the earlier studies (e.g. Salatas and Flavell, 1976; Kelly, Scholnick, Travers and Johnson, 1976) failed to find a relationship between memory and metamemory, some of the later studies did (Perlmutter, 1978; Bisanz, Vesonder and Voss, 1978; Cavanaugh and Borkowski, 1979). However, not satisfied with the consistency of the relationship, Cavanaugh and Borkowski (1980) investigated a wide range of metamemory in normal children. Since this investigation is of importance, the results of this study will be reported in detail.

The authors used the entire metamemory questionnaire of Kreutzer and her colleagues (1975) (see Appendix 1) and also the same population of subjects, namely, kindergartners, and first-, third-, and fifth-graders in their study. To the original study, however, Cavanaugh and Borkowski added three memory tests that lent themselves to transfer.

The materials for the first memory test were 15 categorizable pictures. Each subject was free to study the list in any way he wished and was then tested on free recall. The materials for the second test were three pictures from each of 10 categories plus 10 file boxes on the outsides of which, sample category pictures were pasted. The 30 cards were presented to each child with instructions to hide each one in the appropriate box according to category. Recall

was then requested with the external cues (labels pasted on the boxes) in view. In the third memory test, subjects had to write down certain letters of the alphabet while they were presented, and then re-write them from memory after the first sheet was taken away.

In general, older children had better metamemory than younger ones, a result that Kreutzer el al. (1975) had also obtained. When collapsed across grades, four metamemory subtests, namely, Story-List, Preparation:Object, Retreival: Event and Rote-Paraphrase, correlated with ten or more other subtests. The Story-List subtest correlated with all thirteen other subtests. When taken by grade-level, however, correlations among subtests were substantial only for kindergartners. Sixty-one percent of the eighty-four correlations were significant. In contrast, it was eight per cent for the first-graders, seventeen per cent for the third-graders and eleven per cent for the fifth-graders.

In the first memory test, children used more complex strategies, recalled more items, and clustered more during recall with each higher grade level. A similar developmental trend was found in the second test as well. In the alphabet search, older children clustered and recalled significantly more than younger ones. Within-task and inter-task correlations were significant for all memory tasks with the one exception of the kindergartners whose inter-task scores did not correlate significantly.

Memory-metamemory correlations were broadly based but of moderate strength. Sixty-two of the 112 correlations were significant. Five metamemory subtests, namely, Study Time, Preparation:Object, Preparation:Event, Retroactive Interference, and Rote-Paraphrase, correlated with seven out of eight memory measures, while two metamemory subtests, namely, Study Plan and Opposites - Arbitrary, correlated significantly with all eight memory measures (see Appendix 1 for metamemory questions).

Also, seven of the eight memory measures correlated significantly with at least seven of fourteen metamemory subtests. The memory measures correlated with task-specific, general, as well as peripheral metamemory.

When high and low scores for each metamemory subtest were plotted against high and low (above and below the mean score) scores for the memory measures, cases were classifiable into four groups, namely, low metamemory/low memory; high metamemory/high memory; high metamemory/low memory; high metamemory/high memory. If good metamemory was a necessary prerequisite for successful memory, argued Cavanaugh and Borkowski, no cases should fall into the low metamemory/high memory cell. This situation was not observed. Rather, cases were fairly evenly distributed across the four cells. Thus according to the authors, no support was found for the contention that good metamemory is necessary for good memory.

The contingency analysis as explained in the previous paragraph, indicated that the metamemory subtests, Study Time and Study Plan, both of which were task-specific to the memory measures, were the best predictors of those memory scores. In contrast, the contingency analysis did not indicate that broad metamemory was required for better memory.

Efforts to find a "core" group of metamemory subtests that would predict memory performance were also unsuccessful. Age was a better predictor of memory success than any metamemory subtest.

Thus, although this study produced a wide variety of significant correlations between the 14 indices of metamemory and the 8 measures of memory that were included, the question as to whether broader metamemory skills are more effective for memory performance than task-specific areas remains open because general, specific as well as peripheral areas of metamemory all correlated with measures of memory. Neither did a "core" of metamemorial knowledge that would be necessary for memory emerge. On the contrary, there were indications that good metamemory is not even required for good memory. However, it may not be wise to depend on the results of this one study alone. Replications of this study or other studies similar to this one may be desirable in order to examine the relationship between memory and metamemory more deeply.

In the preceding sections, we have reviewed the various components of metamemory and how they interact with one another. We have also examined aspects of the relationship

between memory and metamemory in general. Against this background, we shall review briefly the findings on memory and metamemory in retardate populations.

C. Memory and Metamemory in Retarded Subjects

The fact that retarded persons have poor memories has been well documented (Campione and Brown, 1977). This phenomenon continues to engage the attention of theorists and researchers to this day. Much of the research done in recent years in the area of retardate memory has been done with the multi-store model of memory (Lupart, 1978). If memory is considered to be comprised of several stores, it is logical to attempt to locate memory deficits in one store or another.

Earlier investigations examined long-term storage. Belmont (1966) reviewed twelve studies on long-term memory but considered only one of them to yield valid results. In that study done in 1959 by Klausmeier, Feldhusen and Check, the subjects were from three I.Q. levels and were tested on four types of arithmetic problems. The general conclusion from this study was that retention was the same among children of low, average and high intelligence when the original learning task was geared to the learner's level of achievement. No further investigations of significance were done of the long-term retention of retarded persons since that time. Instead, retardate memory research was focused on the short-term store.

According to the model of memory proposed by Atkinson and Shiffrin (1968, 1971), different memory-related "control processes" used by the learner are associated with different memory stores. Based on the results of fourteen experiments conducted by himself and his colleagues, Ellis (1970) suggested that poor memory in retarded people was a result of the lack of rehearsal in the short-term store. Belmont and Butterfield (1971) confirmed the conclusion of Ellis with similar experiments. Later, Butterfield, Wambold and Belmont (1973), and Ashcraft and Kellas (1974) demonstrated that the memory performance of retarded persons may be improved even up to the level of the memory performance of untrained non-retarded persons. They did this by teaching rehearsal strategies to their retarded subjects.

Brown, Campione and Murphy (1974) further demonstrated the trainability of retarded persons in memory. The materials they used were several sets of pictures, each set containing pictures from four different categories. Each subject was shown one set at a time and required to keep track of the most recently shown item in each of the categories. The authors trained one half of the subjects (moderately retarded adolescents) to keep track of the items by using a strategy of selective forgetting. Six months later, eight of the ten trained subjects were still using the strategy in a similar task.

The studies reviewed so far in this section indicate that poor memory in retarded persons resulted from the lack of rehearsal or the use of other similar strategies. With training, however, retarded persons can learn to use strategies and consequently improved their memories. When the multi-store model is used as a frame of reference, this deficiency in the spontaneous use of strategies would have to be located in the short-term store ("working memory").

As noted earlier, Bjork's (1975) model of memory dissociated the control processes from the different stores, placing the processes centrally under the control of the subject. Based on this model, Lawson (1978) suggested that the difference between normal and retarded people in memory performance was caused by the failure of the latter to plan and decide on the use of active strategies, a phenomenon, which, according to Lawson, ultimately boils down to intelligence. Thus, deficits in memory came to be blamed on ineffective executive control, a function of low intelligence.

While theorists may be satisfied with such an explanation of retardate memory, circular as it seems, educators have to probe deeper into the content and mechanisms of "executive control" if they wish to design effective teaching programs for retarded students. Craik and Lockhart's model of memory that was described earlier provides a suitable framework for just such a probe.

In their model of memory, Craik and Lockhart (1972) distinguished between Type I processing which merely recirculated information in active memory, and Type II processing that subjected the information to progressively more elaborate and more meaningful analysis. Whether or not a person had the deliberate intention of memorizing, the duration of an item in memory depended on the extent ("depth") to which it was perceptually analysed. This breaking down of memory processes into steps facilitates not only the understanding of memory, but also its remediation.

Lupart (1978) reported two experiments conducted with mildly retarded children and normal children matched for mental age (MA), using the Levels of Processing Model as a framework. The subjects for her experiment were normal children with a mean I.Q. of 102.6 and retarded children with a mean I.Q. of 72.5. In both experiments, subjects of both I.Q. groups retained phonemically processed items better than physically processed ones, and the semantically processed ones best of all. Although significantly different performances pointed to qualitative distinctions between the physical and semantic levels as well as between the phonemic and semantic levels, there was no significant difference in performance to indicate a qualitative difference between physical and phonemic levels.

Although the normal children performed better than the retarded children at all three levels of processing, there was hardly any difference between the groups when the material

was only minimally (physically) analysed. Although both groups retained semantically processed information significantly more than information processed at other levels, it was at the semantic level that differences in performance between the two I.Q. groups was greatest.

The above results show that retarded children perform differently on memory tasks when induced to process information at different levels of analysis even with no intention of memorizing. It still remains unclear as to why they do not perform at the level of normal children.

Based on some of their research, Anderson and Reder (1979) proposed a modification to the Levels of Processing model of Craik and Lockhart. They suggested that it was the quantity (number of elaborations) and not the quality (depth of processing) that affected the durability of a memory trace. Jayawardhana (1981) conducted an experiment to test this theory with both normal and retarded adults. Although the performance of the normal subjects was significantly greater at the semantic level than at the phonemic level, the retarded subjects recalled equal numbers of phonemically and semantically processed words. Thus, Anderson and Reder's theory seemed to be correct, at least in the case of retarded subjects. This suggests that phonemic processing may be as effective a mnemonic strategy as semantic processing for retarded subjects when the quantities or elaboration are the same at each level.

The results of the above studies taken together indicate that even retarded subjects recall significant amounts of information when they are induced to analyse or elaborate information differently. It is difficult to say at what level retarded subjects would process information when no orienting questions are asked. In any case, they will not perform at the level of normal subjects unless very specific strategies for both encoding and retrieval are taught to them (Butterfield, Wambold and Belmont, 1973). If Brown (1974) is correct, metamemorial awareness may be necessary for the spontaneous use of mnemonic strategies.

Brown and Lawton (1977) tested the "feeling-of-knowing" accuracy of educable mentally retarded (EMR) children with mental ages of approximately six, eight and ten years. It was found that children with mental ages of eight and ten recognized significantly more items than the mentally younger children after predicting that they would do so. The older children were also more correct in the estimation of items that they had correctly recalled. Thus, even retarded children are capable of monitoring the contents of their memory, and those with higher mental ages do so with greater success.

In order to assess the trainability of EMR children with regard to knowledge about the limitations of their memories, Brown, Campione and Murphy (1977) worked with 68 children from two mental age groups, namely, six and eight years.

Training in span estimation was done by providing both implicit and explicit feedback. Younger children benefitted only from explicit feedback while the older chidren benefitted from implicit feedback as well. The older subjects who received explicit feedback maintained their estimation skills for over one year. However, training had no effect on the generalization of the skill. Only those who were able to estimate their recall spans accurately before training were able to transfer this skill to a different task. Thus, as in the case of memory performance, retarded subjects may be trained to do specific things and these newly acquired skills may sometimes last for six months to a year or somewhat longer. However, they are unable to generalize these skills on their own.

In a review of studies conducted on both normal and retarded children by herself and her associates, Brown (1978) notes the following:

(a) although EMR children of mental ages six and eight said that the categorization and rehearsal of materials to be learned rather than mere looking would result in better memory performance, only 28 per cent of them actually engaged in the more effective activities when given a memory task,

(b) non-retarded third-graders had a better performance prediction ratio than MA-matched EMR children,

(c) the teaching of specific mnemonic strategies to retarded children may result in the blind following

of rules. Broader training in metamemory may be more effective for helping subjects to cope with the varying demands of different memory tasks,

(d) the teaching of strategies will aid memory performance only if the strategies are compatible with the person's cognitive level.

The above observations further emphasize the mental inflexibility of retarded persons. In other aspects, as when not using their knowledge to enhance their performance of a task, they are like younger normal children who are incapable of translating their knowledge into practice.

Kendall, Borkowski and Cavanaugh (1980) taught EMR children to use an interrogative strategy (ask a "why" question about a relationship) as an aid to paired associate learning. Their subjects had an average chronological age of 10.2 years and average MA of 6.9 years. Metamemory was assessed prior to training and again following the test for generalization. The instruments used for these assessments were adapted versions of Kreutzer et al.'s Story-List, Preparation:Object, and Study Plan subtests. Mounted pictures were used to illustrate these subtests and make them more concrete.

There were no pretest/posttest metamemory differences resulting from the intervening training. A significant correlation was found between pretest metamemory and the quality of elaboration at generalization. Posttest metamemory correlated significantly with

(a) recall during later sessions,

(b) maintenance of strategy, and

(c) generalization.

Feedback on the use of strategies did not affect post-test metamemory. The above results indicate a relationship between memory and metamemory in retarded subjects. The metamemory training given in this study was not very broad. If Brown (1978) is correct, broader training in metamemory will produce even more striking correlations.

Ramayya (1980) examined metamemory development in EMR and TMR (trainable mentally retarded) children and MA-matched normal children. In his pre-task test, he examined only very basic metamemory, namely, only those aspects examined in Kreutzer et al.'s first question (see Appendix 1). The post-task metamemory test was comprised of three simple questions, basically examining the subjects' estimation of their memory span. The subjects were TMR, EMR and normal children with mental ages of six years, and EMR and normal children with mental ages of eight years.

The results indicated that those with higher mental ages scored higher on both metamemory tests. At the mental age of six years, the children in all three I.Q. groups performed equally well on the task of recall estimation. However, at the mental age of eight years, normal children were superior to EMR's in the estimation of recall. Children with higher mental ages scored higher on the recall test and both normal

and EMR children scored equally well. Memory-prediction increased over trials, indicating that practice did affect metamemory, at least in this task-specific aspect. It is noteworthy that mental age and not I.Q. level had effects on both metamemory and memory measures.

The research reviewed so far in this section indicates that mentally retarded persons do have metamemory knowledge that they sometimes make use of in memory tasks, and that those retarded persons with higher mental ages generally do better in both memory and metamemory. However, these studies have had only a narrow scope.

A more comprehensive study of metamemory in retarded persons was conducted by Eyde and Altman (1978). Their subjects were 60 mildly retarded (I.Q.'s between 60 and 75) and 60 moderately retarded (I.Q.'s between 44 and 59) children between the ages of five and sixteen years. The research was conducted in four stages which the authors referred to as the Verification, Measurement, Comparison, and Correlational Phases.

In the VERIFICATION Phase, the authors wanted to deterine whether chronological age and I.Q. level had any effect on the memory performance of retarded children. Within each I.Q. group, the subjects were divided into two sub-groups according to chronological age. There were roughly an equal number of boys and girls in each sub-group. A third of the subjects in each sub-group were shown a set of pictures with

instructions to "remember", while another third received instructions to "look". The remaining third did not receive any specific instructions. The dependent variables that were measured were study behaviours, number of items recalled, clustering at recall, and metamemory (three basic questions to test the subjects' awareness of recall competence and the ease of learning categorizable lists).

In the MEASUREMENT Phase, the authors conducted a metamemory interview using slightly adapted versions of seven of the questions asked by Kreutzer el al., from their subjects in 1975 (see Appendix 1). The questions were: Memory Ability, Recall Judgement, Coloured-Uncoloured, Immediate-Delay, Savings, Preparation:Object, and Preparation:Event. Each child was tested individually and the entire interview was tape-recorded. There were also two memory tests in this phase, one auditory and the other, visual. The subjects were the same as in the previous phase but they were subdivided into four chronological age groups instead of only two.

The data obtained in the Measurement Phase were used in the COMPARISON Phase but they were analyzed differently. For this analysis, the subjects were divided into three equal groups according to mental age, and within each group, into four sub-groups based on chronological age.

Data from both the Verification and Measurement Phases were used in the CORRELATIONAL Phase to compare memory and metamemory scores. The authors also examined how these variables were related to the subject variables of I.Q.,

mental age and chronological age.

Children with higher I.Q.'s displayed better study behaviours, scored higher on the first three metamemory questions (Memory Ability, Recall Judgement and Coloured-Uncoloured) and showed more consistency of choice between coloured and uncoloured pictures.

Chronologically older children displayed more study behaviours, recalled more items, and clustered more during recall. They also scored higher on the metamemory questions Recall Judgement, Immediate-Delay, Preparation:Object, and Preparation:Event.

The highest scores on item-clustering at recall, and on recall itself, were obtained by the chronologically older children with the highest I.Q.'s (I.Q. x Age interaction effect).

Both CA and MA had significant main effects on planfulness during study and the Immediate-Delay metamemory question. Significantly more lower MA children said that black and white pictures were easier to remember than coloured ones. Although chronological age was a significant predictor of memory ability, mental age was a better predictor of it.

Children who displayed planfulness when studying and those who scored high on the metamemory questions Recall Judgement (lists of different lengths), Immediate-Delay, and Savings, scored higher in the memory tests. In general, metamemory correlated with memory performance.

Thus, although retarded subjects may not always use their metamemory knowledge in memory tasks (Brown, 1978), correlations between memory and metamemory are present for this population (Kendall, Borkowski and Cavanaugh, 1980; Eyde and Altman, 1978). Also, retarded persons with higher mental ages possess better metamemory knowledge (Brown and Lawton, 1977; Ramayya, 1980; Eyde and Altman, 1978). If those with lower mental ages do not possess much metamemory awareness, this may be the result of the dependence of metamemory development on cognitive levels as suggested by Brown (1975) and Lawson (1980). The reason why those who possess metamemory among the retarded do not use it in memory tasks may be lack of motivation as suggested by Flavell (1978) because it is well known that many retarded persons lack motivation in many areas of activity (Edgerton, 1979).

In this chapter, it was seen how psychologists came up with different models of memory in order to better understand and explain the possible structures and processes that were responsible for the retention and loss of information by a person. Memory was seen to be an ability that developed from birth to adulthood during the course of which an individual played a progressively more active role in the acquisition of information by ingenious use of strategies that he gradually became aware of. Both normal and mentally retarded people improve their retention skills as they grow older both mentally and chronologically. The stimuli that last longest in memory are those that are anlaysed

elaborately at a meaningful (semantic) level. It was also seen that there were individual differences in the awareness that people have of themselves as memorizers. Although it would seem that such an awareness would be necessary for proficient memory performance, one study (Cavanaugh and Borkowski, 1980) suggested that this may not be the case. Also, the possession of superior metamemory did not guarantee superior memory performance (Brown, 1978). The motivation to remember something may have a lot to do with the degree of performance under any given set of circumstances (Flavell, 1978). While the above statement is probably true for both normal and retarded persons, it may be more true for retarded persons who are known to be generally lacking in motivation for many things. It has also been suggested that metamemory may be dependent on and linked to Piagetian levels of cognitive development (Brown, 1975; Lawson, 1980). If this is true, mentally retarded persons who lag behind normal persons in the area of cognitive development may never be able to attain a level of metamemory that would ensure a high quality of memory performance. The present research has been undertaken in order to further clarify the above indications.

CHAPTER 3

RATIONALE, METHOD, AND HYPOTHESES

A. Rationale

Mentally retarded adults were selected for this study not only because they have been relatively neglected in the research literature but also because the author works with this population and has a special interest in their habilitation. It was hoped that a study such as the present one would result in implications for enhancing memory in retarded adults who are being prepared to live independently in the community. Since memory is required for remembering daily routines, the locations of bus stops and different places in the community etc., the enhancement of memory would contribute towards the improvement of skills for daily living.

The foregoing review of literature suggested that processes initiated by the learner rather than structures may be responsible for effective memory performance. Deeper levels of processing result in more durable memory traces for both retarded and normal people. However, unless a subject has an overall view of the working of memory and the resources available to him (metamemory), he will not be able to perform the task of memorizing very effectively. In spite of this theoretical need of metamemory for more efficient

memory performance, the correlations between metamemory and memory in research studies have been inconsistent. Hence, one of the purposes of this study was to examine the relationship between metamemory and memory for a mentally retarded population in the hope that the result would assist in determining more specifically the relationship between the two constructs.

More basic than the examination of relationships, however, is the establishment of the presence of metamemory in retarded adults. Previous memory and metamemory studies with the retarded have been done mainly with children. Further, they have examined only narrow areas of metamemory. Even Eyde and Altman (1978) examined only seven of the fourteen areas in the questionnaire of Kreutzer et al.(1975). Because retarded persons function at cognitive levels of young normal children, and since Kreutzer and her colleagues found that even kindergartners as a group display metamemorial knowledge in all the areas examined, this is reason enough to suspect that retarded adults would have widespread metamemory knowledge. For this reason, the entire metamemory questionnaire of Kreutzer et al. was used in this study.

The literature has shown that differences in I.Q. affect both memory and metamemory. This study seeks to replicate the finding and also to determine the relationship between the two. Further, full-scale I.Q. will be broken down into Performance and Verbal I.Q. and their relationship to memory and metamemory will be examined in order to find out

more specifically, which components of I.Q. relate most to the two constructs of memory and metamemory.

An addition to the field is the inclusion of measures of adaptive behaviour. Although adaptive functioning is presently included in the definition of mental retardation (Grossman, 1977), most of the previous research on retardate memory has concerned itself with the effects of I.Q. on memory. There has been no attempt to determine the relationship between adaptive behaviour and memory. In light of the fact that memory is required for adequate adaptive functioning such as for the remembering of routines, places, names, etc., it is possible that memory bears a greater relationship to adaptive behaviour than to I.Q.

Recently, Greenspan (1979) has proposed a model of personal competence that creates a theoretical link between "conceptual intelligence" and two other types of "intelligence" that he calls "practical intelligence" and "social intelligence". According to Lawson (1978), efficient memory functioning depends on efficient executive control which is a function of intelligence. According to Greenspan's model (see Appendix VII) adaptive behaviour comes under both practical and social intelligence and is thus linked to conceptual intelligence. This theoretical link will hopefully be clarified at a practical level by the interrelationships between I.Q., adaptive behaviours, and memory in this study.

In order to determine the best predictors of memory performance and the extent to which they account for its variance, a multiple regression analysis will be conducted.

One of the measures of adaptive behaviour is community awareness. Experience has shown this to be essential for independent living. For this reason, another multiple regression analysis will be done to determine its best predictors and the extent to which they account for its variance.

B. Method

(a) Subjects

The subjects for this study were 30 mentally retarded adults of both sexes. The criteria for selection were the ability to understand and answer basic questions and the availability of I.Q. and Adaptive Functioning Scores. Twenty were male and ten were female. Twenty-five were living in residential training facilities while the remaining five lived with their parents. They were between the ages of 21 and 46 with a mean age of 28.37 years and a standard deviation of 6.74 years. None of them had known brain damage. Their full-scale I.Q.'s on the Wechsler Adult Intelligence Scale (WAIS) ranged from 43 to 81 with a mean of 62.20 and a standard deviation of 10.20.

(b) Procedure and Materials for Metamemory Phase

The materials for this part of the experiment were:

(1) a very slightly modified version of the questionnaire used by Kreutzer, Leonard and Flavell in 1975, and

(2) sets of words and pictures to illustrate some of the items on the questionnaire.

The word pairs were either opposites such as "black-white" or arbitrary combinations of names and actions such as "Mary-Walk". They were printed with a thick, black, felt tipped pen in two-inch-high letters on white 4" x 6" index cards and laminated. The pictures were coloured ones and were cut out from various magazines and pasted on 4" x 6" index cards and laminated. One set of pictures was photocopied and these black and white copies were similarly cut out, pasted on index cards and laminated for the Coloured-Uncoloured test. The type of picture used depended on the test it was intended to illustrate. For example, for the Study Plan question, the nine pictures had equal numbers from each of three categories of things. All the pictures were of things that were well known to the subjects. The only instance of new learning was the arbitrary combination of names and actions (Arbitrary Pairs). A complete list of the words and pictures is given in Appendix II.

Each subject (S) was tested individually by the same experimenter (E). The E and the S were seated across a table from each other with only a tape-recorder on the table. The E informed the S that he was going to ask him some questions about remembering but that there were no right or

wrong answers to the questions. The questionnaire and the cards illustrating the questions were on a chair beside the E and hidden from the S's view in order to avoid unnecessary distractions. The E placed a set of cards on the table only when it was required to explain a particular question. The order in which the questions were asked was randomized across subjects and the entire interview was recorded on tape. All the questions were asked during a single session which took approximately 45 minutes. The answers were later scored by the experimenter and an associate. Each one of the questions will be described below.

1. Memory Ability

The purpose of this question was to find out whether the subjects merely took memory for granted or were aware that some things were remembered by them while others were forgotten. The following questions were asked to monitor this awareness:

"Sometimes I forget things. (1) Do you forget? (2) Do you remember things well - are you a good rememberer? (3) Can you remember better than your friends, or do they remember more than you? For example, if I gave you ten things to look at quickly and remember, and you remembered six of them, how many do you think your friend would remember? (4) Sometimes, although a person is a good rememberer, he can still remember some things better than others. Do you

remember some kinds of things better than others?
(5) Are there some kinds of things that are really hard to remember? Now I want to come back to a question I asked you at the beginning. Are there some things that you forget? Are there some kinds of things that you find specially hard to remember?"

2. Savings

The purpose of this series of questions was to find out whether the subjects were aware that although a previously learned list was no longer in their active memories, that a certain remnant trace or "saving" survived to render a subsequent learning of the same list easier. The following questions were asked:

"Let us say that ____ and ____ can learn things equally well, and I wanted them to learn the names of all the kinds of cars in Edmonton. Let us say that ____ had learned them last year and then forgot them. ____ had never learned them before. Do you think that one of them would find it easier to learn the names of all the cars? Which one? Why?"

3. Immediate - Delay

This question was intended to find out whether the subjects were aware of the greater ease of recalling information immediately after it was received rather than later on. The following questions were asked:

"(1) If you wanted to phone a friend and I told you the phone number, would it make any difference if you called right away after you heard the number, or if you got a drink of water first? (2) Why? (3) What do you do when you want to remember a phone number?"

4. Story - List

This question was intended to find out whether the subjects were aware that associations or elaborations among a list of items to be remembered facilitated recall. The following questions were asked:

"Let us say that ____ and ____ are both shown these pictures. When I show ____ the pictures, I simply ask him/her to learn them so that he/she can tell me what they are later when they can no longer be seen. When I show the picture to ____, I also tell him/her a story about the pictures (E puts down each picture on the table as it is mentioned in the story).

A man gets up out of bed and gets dressed, putting on his best tie and shoes. Then he sits down at the table for breakfast. After breakfast, he takes his dog for a walk. Then he puts on his hat and gets into his car and drives to work.

I tell ____ that he/she is supposed to learn the pictures and not the story, so that he/she could tell me what the pictures were when they can no longer be seen. Do you think the story made it easier or harder for ____ to remember the pictures? Who do you think

learned the most? Why?"

5. <u>Coloured - Uncoloured - Spacing</u>

In this question, subjects were asked whether coloured pictures of objects would be easier to remember than black and white pictures of the same objects. Photocopies of the coloured pictures were made and pasted on index cards as were the coloured pictures. After putting the coloured and uncoloured pictures down in two different rows, the E asked the subject:

"You notice that these two sets of pictures are the same except that one is coloured and the other is black and white. If I were to ask you to learn these pictures so that when I cover them up you can tell me what the pictures are, would one of these sets be easier for you to learn? Why?"

With the same materials, the E tried to find out whether subjects were aware that the spreading out of one of the rows was relevant to memory. Therefore, E proceeded to spread out the row that had been judged to be easier, or spread out a randomly selected row if neither had been judged to be easier and asked:

"Would this make any difference? Would this set of pictures still be easier (the same)?"

6. <u>Opposites - Arbitrary</u>

In this question, it was intended to find out whether subjects distinguished between helpful and non-helpful cues to memory. Word pairs were used as materials. At the recall test, one member of the pair was shown and the S was asked to name the other member. One set of word pairs were opposites like good and bad. The other set had arbitrary combinations of names and actions like Mary and Walk. The question was asked as follows:

> "I am going to show you a new way of learning things, I'll show you words in pairs and I'd like you to learn them in such a way so that when I show you one of the words, you can tell me the other word that goes with it" (Study trials are alternated with test trials until S achieves one perfect trial). "Here are two longer lists of words that you can learn in the same way. These words are opposites: "boy" goes with "girl", "easy" goes with "hard" (E completes the list in this fashion). And these words are people and things they might do. So "Mary" goes with "walk" (etc.). Do you think one of these sets would be easier for you to learn? Why?"

At this stage of the question, another variable, namely, quantity, was introduced to see whether the subjects were aware that it is more difficult to remember a larger number of items and also whether they were aware of the interaction or variables. Thus, if the opposite pairs had been judged

to be easier, the E puts down one more card with opposites and asks the subject:

"Now which row is easier to learn, six easier items or five harder items?"

The E continued to add cards until the S indicated that the set of items initially judged to be easier now became more difficult, or until the S said that the addition of any number of items would not make a difference.

7. Study Time

This question was intended to find out whether subjects were aware that more study time facilitated learning. The following format was used:

"I asked two people to look at and learn these pictures (E gestures at the 20 pictures) because I wanted to see how well they could remember, I asked them how much time they would like to have for learning the pictures before I took them away. One person said one minute: The other person wanted five minutes. (1) Why do you think he wanted as long as five minutes? (2) Which person remembered the most, the one who studied one minute or the one who studied five minutes? (3) Why? (4) And what would you do, study for five minutes or one minute? (5) Why?

8. Study Plan

This question intended to determine whether subjects knew that grouping items into categories facilitated learning.

The E Said:

> "Let us say I wanted you to learn and remember these pictures (nine pictures from three categories were used). You can do anything you want with the pictures, you might want to move them around, for example. You will have three minutes to look and learn. Then I will take the pictures away and ask you to tell me what they were. (1) What would you do to learn these pictures so that you would remember them? (2) Did you always learn things this way? (3) Did anyone ever tell you to learn this way? (4) How will a little child learn? (5) How would you have learned them when you were small?"

9. <u>Preparation:Object</u>

This question was intended to find out how strategic the subjects were when preparing to remember something. The words used were:

> "Suppose you were going skating with your friend after work tomorrow and you wanted to be sure to bring your skates. How could you be really certain that you will not forget to take your skates with you to work tomorrow morning? Can you think of anything else? How many ways can you think of? (The activity mentioned depended on the interest of the subject. For example, hockey sticks were used instead of skates in some cases).

10. Preparation:Event

Whereas the previous question monitored the strategies that a subject would use to remember some object, this question wanted to find out what strategies a subject might use to remember an event. The E asked:

"If you were invited to a friend's birthday party, how can you make sure that you will remember his party? Can you think of anything else that you could do to remember? How many different ways of remembering can you think of?

11. Retrieval:Object

Although the search strategies that are monitored by this question are exterior, Kreutzer and her colleagues, who formulated the original questionnaire, maintained that interior strategies followed the same form. Hence, the following problem:

"Suppose you lost your jacket while you were at work, how would you go about finding it? Is there anything else that you could do? Think of all the possible ways that you could remember."

12. Retrieval:Event

This is another question intended to find out the extent of the subject's repertoire of retrieval strategies. Instead of remembering an object, however, this has to do with remembering an event. The question was formulated as follows:

"Suppose one of your friends had a dog and you asked him how old it was. He tells you that it was born one Christmas but he cannot remember which Christmas it was. What things could he do to help him remember which Christmas it was? Is there anything else that you think he can do?"

13. Retroactive Interference

This question was intended to find out whether subjects were aware that similar kinds of information in one's memory interfered with one another, causing confusion and/or forgetting. The E used the following words:

"One day, two friends went to a party and they met eight people whom they did not know before. The names of the people they met were: Bill, Fred, Jane, Sally, Anthony, Jim, Lois and Cindy. After the party, one friend went home and the other went to play hockey. During hockey, he met seven people whom he had never met before, and their names were: Sally, Anita, David, Maria, Jim, Dan and Fred. Later that evening, each of the friends tried to remember the names of the people they had met at the party. Which one do you think remembered more people who were at the party, the one who went straight home after the party, or the one who went for hockey and met more new people? Why?"

14. Rote - Paraphrase

This question explored the subject's awareness of the greater ease of remembering the gist of a story rather than

the exact words. It was asked in this manner:

"The other day, I played a record of a story for a girl. I asked her to listen to the story as many times as she wanted to so that she could tell me the story later. Before she began to listen to the record, she asked me whether she was supposed to remember the story word for work, just like on the record, or whether she could tell me the story in her own words. (1) Why do you think she asked me this question? (2) Would my answer have made any difference in how she studied the story? (3) If I had told her to study it word for word, what do you suppose she did? (4) What do you think she would have done if I asked her to tell me the story later in her own words? (5) Would it be easier to learn a story word for word or be able to tell it in your own words? (6) Why?"

(c) <u>Criteria for Scoring Metamemory Subtests</u>

The answers were categorized in the same way that Kreutzer and her colleagues (1975) categorized them. However, these authors only conducted a descriptive analysis and did not actually score the answers. Cavanaugh and Borkowski (1980) used the same questionnaire and scored the answers but did not specify the method of scoring. Hence, a method of scoring had to be determined. In general, a score of three was given for the best answer to each distinct question. Some of the "questions" in the questionnaire contained more than one distinct question. Questions involving a choice

between only two alternatives, received a maximum score or two. For a detailed description of the scoring procedure, see Appendix III.

Instead of calculating inter-rater reliability, the two raters listeneed carefully to the recorded answers and reached an agreement as to how each answer was to be scored. This was done because most of the answers fell into straightforward categories. For example, when asked whether coloured pictures were easier to remember than black and white ones, the answer had to be "yes", "no", or something to the effect of "it makes no difference". Any other type of answer would have been classified as "other". With the exception of three answers regarding which compromises had to be agreed upon, the raters agreed initially regarding every other answer. These three questions had to do with the only instance where a question of interpretation was involved, namely, as to whether a search for a lost object was systematic and exhaustive, or whether it was merely a randomly ordered series of search procedures.

The term, "General Metamemory" stood for the total score on all 14 subtests while "Specific Metamemory" was the aggregate of scores for the 6 metamemory questions on which the memory tests were based.

(d) Procedure and Materials for Memory Phase

As in the case of the metamemory questionnaire, the E was seated across an empty table from the S with the test

material on a chair beside him. The materials for each test were placed on the table only when needed. The order of presentation of the tests to the subjects, and the order of presentation of the materials within each test, were randomized. All the tests were administered during a single session of approximately 45 minutes. The experimenter wrote down the answers as they were given and scored them later.

Of the 14 questions on the metamemory questionnaire, 8 were selected for the construction of corresponding memory tests. The other questions were excluded for the reasons given below. The questions that were excluded were Memory Ability, Savings, Preparation:Object, Preparation:Event, Retrieval:Object, and Retrieval:Event.

The question, "Memory Ability" included such sub-questions as "Do you remember things?", "Do you remember better than your friends?", etc. Verifications of the answers given by each subject were obtained in the other memory tests. It was difficult to construct a scorable test for this question alone.

It was not possible to construct a memory test for "Savings" since there was no way of finding out what materials each subject had previously learned and then forgotten.

Answers to the other four questions that were exluded had already been given in the metamemory part of the questionnaire. They involved the knowledge of strategies and not materials to be remembered.

The results of two of the eight remaining questions had to be discarded because of floor effects. One of these concerned the remembering of a telephone number for a long or short interval, and the other concerned the remembering of a short story, word for word.

Two sets of seven pictures of comparable content were used for the "Story-List" memory test (see Appendix V). A short story was made up with each set of pictures. Each subject was shown both sets of seven pictures, one set in list format, and the other set in story format. When showing pictures in a story format, the E put down the pictures face upwards on the table, each one at the time at which it was mentioned within the context of the story. Half the subjects saw one set of pictures in story format and the other set in list format. The sets were reversed for the remaining half of the subjects.

Twelve coloured pictures of common objects and their black and white photocopies were used for the "Coloured-Uncoloured" memory test. The E named each picture as he placed it face upwards on the table. After all the pictures had been placed on the table in this manner, the E removed them and asked the S to recall as many of the pictures as he could. Half the subjects were shown the coloured pictures and the remaining subjects were shown the black and white ones.

Twelve pairings of opposite words and twelve pairings of names and actions were used in the Opposites-Arbitrary

memory test. The E used one set at a time, naming both members of each pair of words as he did so. After all the cards had been placed on the table, the S was given two minutes to study them. Then the E removed the cards and informed the S that he (E) would name one word of each pair and that S should try to name the other. The procedure was repeated with the other set. Half the subjects were shown the opposite pairs first and the other half were shown the arbitrary pairs first.

Two lists of ten words each matched for content were used for the "Study Time" memory test. The E placed the cards of a set face upwards on the table, naming each one as he did so. After all the cards of the set had been placed on the table, the S was given either one or two minutes to study them. After the given time, the E removed the cards and asked the S to recall as many of the cards as he could. Half the subjects were shown one set of cards for one minute and the other set for two minutes. The sets were reversed for the other subjects. Also, half the subjects studied a set for one minute first, and the other half studied a set for two minutes first.

Three pictures in each of six categories of things were used as materials for the "Study Plan" memory test. The E placed the pictures one by one on the table, naming each one as he did so. For half the subjects, the pictures were presented randomly. For the other half, the pictures were placed according to categories in six rows. After placing

the three pictures of each category in a row on the table, the E informed the S of the category to which they belonged. After a study period of two minutes, all the pictures were removed from the table and the S was asked to recall as many of the pictures as he could. The subjects who were shown the pictures in random order were not permitted to rearrange the pictures for the purposes of learning them.

Fifteen faces of both men and women with name tags were used as materials for the "Retroactive Interference" memory test. The S was first shown the pictures of eight people, one by one. The E explained that these were the people that two friends met for the first time at a party.

After all the pictures had been placed on the table, the S was given two minutes to look at them. The E then removed those pictures and placed seven more on the table, one by one, naming them as he did so, and explained to the subject that these were the people that one of the friends met for the first time at a hockey game that he went to after the party. (The other friend had gone straight home after the party). Half the subjects were shown both lists while the other half were shown only the first list. After the presentation of the pictures, each subject was asked to recall the names on the first list.

It will be noticed that although there were twelve tests in all, each subject was tested on only nine tests because each subject was tested on only one of the two alternatives in the Coloured-Uncoloured, Study Plan, and

Retroactive Inteference memory tests. The reason for the above was to have only a single set of materials for each of the above three tests in order to avoid differences due to various associations.

(e) <u>Materials for Scores of Adaptive Behaviour</u>

The indices of adaptive behaviour used in this study were obtained from the Adaptive Functioning Index (Marlett, 1971). This instrument is listed by Myers, Nihira and Zetlin (1979) as one of many like it that were designed to cater to the new definition of mental retardation that included adaptive functioning. Unlike some of the other instruments that were based on a behaviour trait theory with developmental underpinnings, Marlett's index was based on an inventory of desirable behaviours for the most part. Only the Social Education Test component of it has some developmental progression based on Piagetian lines. The Residential and Vocational checklists are listings of desirable behaviours.

The construct "community awareness" was taken from the Social Education Test section of the Adaptive Functioning Index (AFI) and contained questions such as "Whom would you phone if you had a problem with your mail delivery?", "Tell me the name of one industry", "How much does a stamp cost to mail a local letter?" etc. There were 20 such questions.

The construct "neatness" was comprised of lists of skills from the areas of "cleanliness", "appearance" and "room management" as found in the Residential Checklist of the AFI.

The construct "self-help skills" was comprised of the areas "transportation", "shopping" and "cooking", also from the Residential Checklist.

The construct "personal skills" was comprised of the areas "considerateness", "leisure", "getting friends", "keeping friends" and "handling problems". These were also taken from the Residential Checklist. Items on the checklists dealing with verbal and number skills were left out since these were examined in the WAIS subtests.

These scores were found in the records of most of the subjects. It was not possible to obtain scores in adaptive behaviour for five of the thiry subjects who were living at home and on whom the checklists were not scored. Appendix VI gives a detailed description of the measures.

(f) I.Q. Measures

Full-scale I.Q., Verbal I.Q., Performance I.Q. and Digit Span were measured on the Wechsler Adult Intelligence Scale (WAIS). Most of the subjects had recent scores for the above in their records. Those who did not have them were tested in the Education Clinic of the University of Alberta.

C. Hypotheses

(a) Metamemory - Memory Relationships

The research has indicated that correlations between metamemory and memory have been obtained although the results

have not been consistent (e.g. Cavanaugh and Borkowski, 1980; Eyde and Altman, 1978). This topic will be discussed at greater length later in the paper. For the present, the following hypotheses are proposed as being in keeping with the research:

Hypothesis 1.1: There will be a significant positive correlation between General Metamemory and Memory Achievement.

Hypothesis 1.2: There will be a significant positive correlation between Specific Metamemory and Memory Achievement.

Hypothesis 1.3: There will be a significant positive correlation between the metamemory question, Study Time and the memory score for the list presented for two minutes.

Hypothesis 1.4: There will be a significant positive correlation between the metamemory question, Story-List, and the memory test, Story.

Hypothesis 1.5: There will be a significant positive correlation between the metamemory question, Opposites-Arbitrary and the memory test, Opposites.

Hypothesis 1.6: There will be significant differences between the scores on each of the six pairs of memory tests corresponding to the six metamemory questions.

(b) I.Q. Scores

The 30 subjects in the study were divided into three equal groups of ten each according to full-scale I.Q. scores on the Wechsler Adult Intelligence Scale. Scores ranged from 43 to 56, 67 to 64, and 65 to 81 for the three groups respectively. It has been shown that retarded persons with Higher I.Q.'s obtain higher scores in memory and metamemory (Eyde and Altman, 1978). Similar results are expected in this study. Hence,

Hypothesis 2.1: Those with higher I.Q.'s will recall more items in the total battery of memory tests.

Hypothesis 2.2: Those with higher I.Q.'s will obtain higher scores for general metamemory.

(c) Adaptive Behaviour

As mentioned earlier, mental retardation is defined by both sub-average intelligence and deficiency in adaptive functioning (Grossman, 1977). Thus, the poor retention of retarded subjects may result partially from poor adaptive functioning. However, not all aspects of adaptive behaviour may be related to memory.

The construct, "self-help skills" includes skills in meal preparation, transportation, shopping, etc., all of which require the remembering of things such as recipes, numbers of buses, prices of things and so forth. Hence,

Hypothesis 3.1: There will be a significant positive correlation between Self-Help Skills

and Memory Achievement.

The construct, "community awareness" includes the knowledge of places in the community, what to do in various emergencies, what goes on in different areas of work, etc. It involves both knowledge (based on memory) and awareness. Hence, the following hypothesis:

Hypothesis 3.2: Community Awareness will correlate significantly with both Memory Achievement and General Metamemory.

(d) <u>Best Predictors of Memory and Community Awareness</u>

Of the numerous variables included in this study, a few of them seemed to be likely predictors of good memory performance. These (General Metamemory, Specific Metamemory, Full-Scale I.Q., Verbal I.Q. and Digit Span) were selected for a stepwise Multiple Regression Analysis. Based on previous research (e.g. Eyde and Altman, 1978), the following hypothesis was proposed:

Hypothesis 4.1: The best predictor of Memory Achievement will be Full-Scale I.Q.

Of the practical skills required for independnet living in the community, one of the most important is "community awareness". Since a distant goal of this research is to help retarded adults living independently in the community to enhance their memories, a relevant question seemed to be, "What is the best predictor of Community Awareness?" Once again, a few likely variables were selected for another

step-wise Multiple Regression Analysis. These variables were: General Metamemory, Specific Metamemory, Memory Achievement, Full-Scale I.Q., Verbal I.Q., and Digit Span. Based on a hunch, the following hypothesis was proposed:

Hypothesis 4.2: The best predictor of Community Awareness will be Memory Achievement.

CHAPTER 4

RESULTS

For the sake of clarity and consistency, the results will be presented in separate sections, following, as much as possible, the order in which the hypotheses were stated. Although it was possible to examine many aspects of metamemory and memory and analyse the results in many different ways, only some facets have been highlighted for the purpose of this paper.

(a) Metamemory

Answers to the metamemory questions were scored as indicated in Appendixes III and IV. The total possible raw score for all the questions was 74 but the scores were also represented and analysed in the computer programs in terms of percentages. The mean score for the entire sample was 31.07(41.99%). Six of the thirty subjects scored over 37(50%). The highest individual score was 51(68.9%) while the lowest score was 13(17.6%). Table 1 presents the percentage scores for each subject.

Although some of the subjects obtained a score of zero for some of the questions, as a group, the subjects displayed metamemory awareness in all the areas that were examined (see Table 2). Mean percentage scores for five of

the fourteen questions exceeded the half-way mark. Thus, metamemory knowledge was fairly widespread for this sample but was not very high.

As mentioned earlier, "Specific Metamemory" was so named because the six metamemory questions comprising it are task-specific to the memory tests. Percentage scores for Specific Metamemory were higher than those for General Metamemory (see Table 1). This is not surprising since four of the six questions comprising this obtained mean percentage scores of over fifty. Thus, even though the scores for General Metamemory were not very high, the actual memory tests were based on those questions about metamemory on which the subjects scored high.

Twenty-four of the 91 correlations between metamemory questions were significant (see Table 3). Preparation: Object correlated significantly with seven other questions while Immediate-Delay, Preparation:Event, Retroactive Interference and Rote-Paraphrase correlated significantly with at least five other questions.

(b) Memory

As indicated in the previous chapter, one point was assigned for each item that was ocrrectly recalled. Each subject was thus able to score a maximum of 96 points on all the tests combined. The "Memory Achievement" score that was used in the statistical analysis was a percentage of the maximum possible raw score.

Two thirds of the subjects scored over fifty (per cent). The highest individual score was 93.3 and the lowest was 29.2 with a mean of 63.6 (see Table 1).

Scores for the individual memory tests are given in Table 4. With the exception of Arbitrary Pairs, all the other memory tests obtained mean scores of over fifty (per cent).

Thus, according to the methods of scoring that were used, higher percentage scores were generally obtained for memory than for metamemory.

Twenty-seven of the thirty-six correlations between memory tests were significant (see Table 5). Thus the percentage of memory tests that correlated significantly with one another was greater than the percentage of metamemory questions that correlated significantly with one another. This suggests that the memory skills of the subjects are more systematically developed than their metamemory skills.

(c) Metamemory-Memory Relationships

Table 6 shows some of the significant correlations that were obtained in the study. It indicates that Memory Achievement correlated significantly and substantially with both General Metamemory ($r= .6859$, $p < .001$) and Specific Metamemory ($r= .5879$, $p < .001$). These results support Hypotheses 1.1 and 1.2

The correlations between the metamemory and memory subtests are presented in Table 7. It will be seen that 24

out of the 84 possible correlations were significant at the $p=.05$ level. However, the metamemory subtest Study Time did not correlate significantly with the memory score for the list studied for two minutes. Neither did the metamemory subtest, Opposites-Arbitrary correlate significantly with the score for opposite pairs on the memory test. Thus, there was no support for Hypotheses 1.3 and 1.5. The only metamemory subtest that correlated significantly with its corresponding memory subtest was Story List ($r=.6423$, $p<.001$), lending support to Hypothesis 1.4.

Following, Cavanaugh and Borkowski (1980), scores of Memory Achievement, Specific Metamemory and General Metamemory were divided into high and low scores according to whether they were above or below their respective mean scores for a contingency analysis (see Tables 8 and 9). This analysis indicated that 13 of the 16 subjects who scored high in memory scored high in General Metamemory as well. There was less consistency between those who scored high in memory and Specific Metamemory (16 and 9 respectively) although the consistency was highest for those who scored low in both memory and Specific Metamemory. Chi Squares were calculated for the contingency tables. From these, further evidence was obtained that General Metamemory was not independent of Memory Achievement ($X^2 = 8.464$, $p<.01$, $df=1$). Specific Metamemory was also found to be dependent on Memory Acheivement ($X^2 = 3.99$, $p<.05$, $df=1$).

Scores for the individual memory tests are given in Table 4. The only significant difference within pairs of tests was between Opposite Pairs and Arbitrary Pairs. Thus, Hypothesis 1.6 which stated that there would be significant differences between the pairs within each of the 6 subtests was only partially supported.

(d) I.Q. Effects

As mentioned in the previous chapter, the thirty subjects in the study were divided into three groups of ten according to full-scale I.Q. scores on the WAIS. Subjects in the low I.Q. group had I.Q.'s ranging from 43 to 56 with a mean of 51.4; subjects in the middle group had I.Q.'s ranging from 57 to 64 with a mean of 60.9; those in the high I.Q. group had scores ranging from 65 to 81 with a mean of 74.3. One-way analyses of variance utilizing General Meta-memory and Memory Achievement as dependent variables indicated the following:

Full-scale I.Q. had a main effect on Memory Achievement ($F_{2,29}$=8.426, $p<.002$). This result lends support to Hypothesis 2.1. Although there were significant differences between the low and high I.Q. groups, and the medium and high I.Q. groups ($p<.05$), there were no significant differences between the low and medium I.Q. groups according to Scheffe post hoc tests. This result lends support to Hypothesis 2.1.

Full-scale I.Q. had a main effect on General Metamemory as well ($F_{2,29}=5.698$, $p<.01$). This result supports Hypothesis 2.2. Post hoc Scheffe tests indicated that although there were significant differences ($p=.05$) between the low and high I.Q. groups and between the medium and high I.Q. groups, there was no difference between the low and medium groups. This result supports Hypothesis 2.2.

(e) Adaptive Behaviour

Recent indices of adaptive behaviour as scored on standard measures constructed by Nancy Marlett (1971) were available in the records of 25 out of the 30 subjects (see Appendix VI). Some of these measures of adaptive functioning follow a developmental progression (Brown, R.I., 1978). Areas of adaptive behaviours were combined as shown in Appendix VI to obtain four measures for the purposes of this study. An analysis of Pearson Correlational Coefficients showed the following:

Self-help skills correlated significantly with Memory Achievement ($r=.579$, $p=.008$). This result support Hypothesis 3.1.

Community Awareness correlated significantly with both Memory Achievement ($r=.6121$, $p,<.002$) and General Metamemory ($r=.5983$, $p<.002$). This result supported Hypothesis 3.2.

(f) Best Predictors of Memory and Community Awareness

General Metamemory came out as the best predictor of Memory Achievement, accounting for approximately 45 per cent of its variance (R^2=.4709, adjusted R^2=.4516, N=30, F=24.8787, $p<.001$). This result did not support Hypothesis 4.1 which stated that Full-Scale I.Q. would be its best predictor. The second best predictor of Memory Achievement was Full-scale I.Q. Together, General Metamemory and Full-scale I.Q. accounted for approximately 52 per cent of the variance of Memory Achievement (R^2=.5503, adjusted R^2=.5170, N=30, $p<.001$).

Verbal I.Q. came out as the best predictor of Community Awareness accounting for approximately 43 per cent of its variance (R^2=.4527, adjusted R^2=.4289, N=25, F=19.0262, $p<.003$). This result did not support Hypothesis 4.2 which stated that Memory Achievement would be its best predictor. The next best predictor of Community Awareness was General Metamemory. Together, Verbal I.Q. and General Metamemory accounted for approximately 54 per cent of the variance (R^2=.5782, adjusted R^2=.5398, N=25, F=15.0773, $p<.002$). This result did not support Hypothesis 4.2.

CHAPTER 5

DISCUSSION

In this chapter, the results of the present study will be discussed in conjunction with the findings of other studies. Although various aspects of a central theme are bound to be brought up together in any discussion, an attempt will be made to discuss the findings in a logical order under various headings.

1. Metamemory in the Retarded

Although the memory functioning of the retarded has been fairly well researched and documented (Campione and Brown, 1977), only a few studies have examined metamemory in this population. Most of these have focussed on very narrow and specific areas of metamemory (e.g. Brown and Lawton, 1977; Brown, Campione and Murphy, 1977; Kendall, Borkowski and Cavanaugh, 1980; Ramayya, 1980). Only Eyde and Altman (1978) conducted a fairly broad survey of metamemory in the retarded, and even they restricted their scope because they thought that the lack of verbal skills in this population would foil attempts at a wider investigation.

Eyde and Altman found that retarded persons have metamemory knowledge in all the areas that were probed. In an attempt to broaden the scope of inquiry, the present study ambitiously included all the questions that were used by

Kreutzer and her colleagues (1975) and later by Cavanaugh and Borkowski (1980) with normal children. In order to overcome any obstacles that may have been caused by the lack of verbal skills, some of the questions were very slightly modified. The results indicated that the sample, as a group, had metamemory knowledge in all the areas that were examined although some of the subjects obtained scores of zero in some of the subtests. That is, some of the subjects, on an individual basis, did not have metamemory in some of the areas examined.

Following Cavanaugh and Borkowski (1980), a correlational analysis was conducted to determine whether different areas of metamemory in the population correlated with one another. Twenty-four of the 91 (26.37%) correlations between metamemory subtests in the study were significant. In the study done by Cavanaugh and Borkowski, 58% were significant when the data was collapsed across grades. Eight questions in Cavanaugh and Borkowski's study correlated significantly with at least eight other questions as compared to five questions in the present study correlating significantly with at least five other questions. Thus significant correlations among questions were only half as numerous (approximately) for this population as for normal children. This suggests that metamemory knowledge is somewhat randomly scattered in retarded adults and that there is no parallel development of the various aspects of metamemory.

It is not known how metamemory may be improved in retarded subjects. Kendall and his colleagues (1980) found that training did not improve metamemory in the narrow area studied although Ramayya (1980) found that practice in memorizing did so. It is conceivable, however, that the enhancement of more basic skills may provide the instrument for the enhancement of metamemory. For example, encouraging retarded adults to reflect on their actions may increase their awareness regarding memory and other cognitive activities like problem solving as well.

2. <u>I.Q. and Metamemory</u>

Studies have shown that metamemory develops with age in normal children (Kreutzer, Leonard and Flavell, 1975: Cavanaugh and Borkowski, 1980). That is those with higher mental ages display more metamemory. Previous studies with the retarded also indicate that those with higher mental ages possess greater metamemory knowledge (e.g. Brown and Lawton, 1977; Ramayya, 1980; Eyde and Altman, 1978).

Brown (1975) and Lawson (1980) have both suggested that metamemory may be linked to and dependent on stages of cognitive development. Although these two authors were thinking in terms of cognitive development as measured on a Piagetian scale, the idea may be true when cognitive development is measured in terms of mental ages on a scale such as Wechsler's as well. If this be the case, the upper limit of metamemory knowledge that an adult could have may be related to his I.Q.

3. The Relationship Between Metamemory and Memory

The nature of metamemory suggests that it should be related to memory performance. In fact, Brown (1975) stated that metamemory would be necessary for efficient memory functioning. In spite of this, earlier attempts at establishing a relationship between the two constructs has not had the success that was expected.

The earlier attempts, both with normal and retarded subjects, dealt with only a few areas of metamemory (e.g. Salatas and Flavell, 1976; Kelly, Scholnick, Travers and Johnson, 1976; Ramayya, 1980). Neither of the first two studies found any significant correlation between metamemory and memory, although Ramayya, working with retarded children, found that practice at memorizing improved task-specific metamemory. Two other studies (Bisanz, Vesonder and Voss, 1978 and Cavanaugh and Borkowski, 1979) found significant correlations between the two areas. However, the aspects of metamemory that were examined were narrow once again.

Kendall, Borkwoski and Cavanaugh (1980) tested retarded subjects on adapted versions of Kreutzer et al.'s Story-List, Preparation:Object, and Study Plan subtests (see Appendix 1). In this research, a broader sprectrum of metamemory was examined. The results of the study indicated a relationship between metamemory and memory for retarded children in the areas that were studied.

A still broader spectrum of metamemory was examined by Eyde and Altman (1978). They used adapted versions of seven of the fourteen questions used by Kreutzer et al. Their subjects were retarded children. It was found that three of the areas examined correlated highly with memory performance.

The broadest study of metamemory-memory connections to date was conducted by Cavanaugh and Borkowski (1980). They used the entire questionniare of Kreutzer et al. as well as the same population of subjects (kindergartners, first-, third- and fifth-graders). They also included three memory tests for each of which they computed different measures of memory performance such as strategies used, clustering during recall, and number of items recalled. One of the tests did not have a strategy measure. Thus there were 14 measures of metamemory and eight measures of memory.

Sixty-two of the 112 correlations between metamemory questions and memory tests were significant but of moderate stength. The memory measures correlated with task-specific, general, as well as peripheral areas of metamemory and it could not be established from these results that general metamemory as opposed to specific metamemory, was more useful for memory performance. When high and low scores for metamemory and memory (above and below the respective means) were plotted, it was found that there were instances of high memory and low metamemory. Cavanaugh and Borkowski used this fact to argue that good metamemory was not necessary

for good memory.

The memory tests used in the present study were concerned with recall performance as well as with differences of performance resulting from differences in materials (e.g. coloured vs. uncoloured), task demands (e.g. cued for opposite pairs vs. uncued for arbitrary pairs), and strategies (e.g. categorizing vs. not categorizing materials to be studied). The metamemory questions were the same fourteen that were used by Cavanaugh and Borkowski with slight modifications.

Only one metamemory test correlated significantly with its corresponding memory test (Story-List with "Story"). Also, a fairly high mean score (54.2) for the Opposites-Arbitrary metamemory test corresponded to a significant difference between the mean recall scores for opposite pairs and arbitrary pairs of words. In spite of this low correspondence between individual metamemory and memory test scores, 24 of the 84 correlations between metamemory and memory measures were significant. Further, the correlations between the aggregate score for memory and both "General Metamemory" (aggregate for all the metamemory questions) and "Specific Metamemory" (aggregate for the six metamemory tests on which the memory tests were based) were both significant and substantial. The fact that most correlations between metamemory and memory were not significant at the individual level may have been due to the fact that the range of scores for some of the metamemory tests was very narrow (sometimes

a maximum of only two points).

Cavanaugh and Borkowski (1980) had found that task-specific, general, as well as peripheral areas of metamemory correlated with the memory measures. In the present study, with the one exception of Story-List with Story, only general and peripheral measures of metamemory correlated with measures of memory (e.g. the memory test opposite pairs correlated with the metamemory questions, Story-List, Preparation:Object, and Retrieval:Event).

This finding supports the contention of both Flavell (1978) and Brown (1978) that broader metamemory rather than task-specific knowledge may be related to memory performance. In fact, the multiple regression analysis indicated that General Metamemory was a better predictor of memory performance than Specific Metamemory. This result was further borne out by the contingency analysis. While 13 of the 16 subjects who scored above the mean in memory performance also scored above the mean in General Metamemory, only nine of the 16 scored above the mean in Specific Metamemory.

The lack of a relationshipo between individually corresponding metamemory and memory tests is another argument in favour of the greater relationship of general metamemory over specific metamemory to memory performance. We have already seen the lack of significant correlation (with one exception) between corresponding metamemory and memory tests. The other instance is the lack of a significant difference in mean recall scores between rival pairs of a memory test.

That is, even when the mean score for a particular metamemory question was high (e.g. 69.12 for Coloured-Uncoloured), the difference in mean scores for the two memory tests that correspond to this metamemory question (a set of coloured pictures and a set of uncoloured pictures) was not significant ($t = .023$, $p > .20$). This suggests that even when subjects (in this case) knew that coloured pictures are easier to recall, they did not, in fact, recall coloured pictures more than uncoloured ones. With one exception, such was the general case for all the memory tests based on metamemory questions. This would have resulted either because the subjects did not apply their knowledge to actual practice, did not know how to do so, or used other resources to remember the alternate set of items (e.g. uncoloured pictures) well. It may also indicate that the subjects recalled both rival lists effectively, not so much due to task-specific metamemory, but due to more general knowledge about the workings of memory. Such an interpretation is more probable due to the fact that the other results in this study also support it.

Cavanaugh and Borkowski (1980) argued that if some of those who scored above the mean in memory, scored below the mean in metamemory, the contention that good metamemory would be necessary for good memory (Brown, 1975) would not be supported. In their own study with normal children, they found a few subjects who obtained high memory scores in spite of low metamemory scores.

However, in that study, the contingency analysis examined task-specific areas of metamemory. If broader metamemory and not task-specific areas of metamemory are responsible for memory performance, their argument would hold only if a contingency table for broader metamemory and memory performance found instances of low metamemory and high memory performance. Such a table was drawn up in the present study and only three of the 16 subjects who scored above the mean in memory scored below the mean in metamemory. While the method of scoring memory was straightforward, the method of scoring metamemory was relatively arbitrary in the sense that no standard method has as yet been devised. It is possible that had some other method of scoring metamemory been used, that all those who scored above the mean in memory would also have scored above the mean in metamemory. While the suggestion of Brown (1975), namely, that metamemroy would be necessary for memory cannot be supported by the present results, it is possible that further refinements in the measurement of metamemory would lend stronger support to this contention.

It was found in the present study that the metamemory questions Story-List, Preparation:Object, Preparation:Event, Retrieval:Object, and Retrieval:Event, correlated significantly with at least three of the six metamemory tests that all 30 subjects answered. Of these, Preparation:Object, Preparation:Event, and Retrieval:Event correlated significantly with at least six of the eight memory measures in the

study conducted by Cavanaugh and Borkowski (1980) as well. It is possible that these three areas of metamemory that concern the use of strategies as opposed to task and person variables, constitute a sort of "core" of metamemory knowledge that is required for good memory functioning.

From all of the above, it is fairly clearly seen that metamemory and memory are closely related to each other and that broader metamemory knowledge as opposed to knowledge that is specific to a given task has a greater positive relation to memory performance. Although a causal relationship cannot be deduced from correlations, the concept of metamemory logically suggests that metamemory, especially in its greater breadth, may play a mediational role between intelligence and memory performance, providing the learner with a choice of strategies for the exercise of executive control. The fact that general Metamemory is the best predictor of memory performance accounting for 45 per cent of its variance, provides some support for such a speculation.

4. Adaptive Behaviours

As mentioned earlier, four measures of adaptive behaviour, namely Personal Skills, Neatness, Self-Help Skills, and Community Awareness, were included in the study. Of these, Personal Skills did not correlate significantly with any of the major variables like I.Q., memory, or metamemory.

Personal Skills was comprised of aspects such as considerateness, making use of leisure time, making and keeping

friends, and handling personal problems. Although a certain amount of memory is involved in these skills (as in most other skills), no special correlation was expected and none was obtained.

The variable, Neatness, which was comprised of skills in cleanliness, appearance, and room management, is usually the result of ingrained habits or routines. Not much memory or awareness is involved and neither was any sort of relationship expected. It was interesting to note, however, that it correlated positively and significantly with Sex. At least for the present population of subjects, women seem to have greater skills in this area than men.

It would seem almost self-evident that the skills comprising the measure, Self-Help Skills, namely, transportation, shopping and cooking, require memory. The results of this study bore this out since thie measure correlated significantly with Memory Achievement. It also correlated significantly with Specific Metamemory although it did not do so with General Metamemory. As can be seen, Specific Metamemory included areas of memory awareness that concerned the mnemonic properties of materials and simple strategies but not the knowledge of more flexible and sometimes ingenious strategies that were monitored by some of the other items on the questionnaire. It stands to reason that although good memory and basic types of awareness and flexibility are required for cooking, shopping and finding one's way around, no special ingenuity (as monitored by General

Metamemory) would be necessary.

Although self-help skills are basically required for success in independent living, they are not enough. The experience of those of us in the field of habilitation indicates that clients have to be aware of the norms and demands of the community around them if they are to succeed in independent living. For this reason, the correlates of Community Awareness obtained in this study are of great interest. The results have shown that Community Awareness correlates significantly not only with measures of memory and metamemory but also with measures of I.Q. These results can generate speculations on many fronts.

First of all, it helps to define more clearly the concept of mental retardation. Ever since mental retardation began to be defined as "significantly sub-average intelligence together with deficits in adaptive behaviour" (Grossman, 1977), theorists have been trying to find a measure of adaptive behaviour which may be used independently of an I.Q. score to identify somebody as mentally retarded. Various measures of adaptive behaviours have been developed but most of them are used as starting points for teaching programs rather than for purposes of definition (Myers, Nihira and Zetlin, 1979). Although the construct of Community Awareness, as used in this study, is crude (devoid of factor validity) it is a good candidate for further refinement in the quest for a behavioural counterpart to I.Q. scores in the definition of mental retardation.

The fact that Community Awareness correlates significantly with both Verbal and Performance I.Q. tends to highlight the general all-round competence required for community living. In this respect, Community Awareness could well be a "practical expression" of the construct of "Adaptive Intelligence" in Greenspan's (1979) model of Personal Competence (see Appendix VII).

One of the differences between memory and metamemory is found in the degree of abstraction. While memory deals with the act of remembering, metamemory stands back, surveys the field, and abstracts from experience, the common denominators of memory functioning. Any variable that correlates with both memory and metamemory can be expected to be both concrete and abstract. Community Awareness is one of them.

A question that is both theoretical and practical is, "What is the best predictor of Community Awareness?" Although memory and metamemory both seemed likely candidates, it was found that Verbal I.Q. claimed this role.

Verbal I.Q. scores are comprised of scores on the Information, Comprehension, Arithmetic, Similarities, Digit Span and Vocabulary subtests. A good repertoire of words (what the Vocabulary subtest measures) also indicates a good repertoire of concepts or information about different objects or actions that the words represent. This, along with the general knowledge that is measured by the Information subtest, would be very similar to the information content that is monitored by Community Awareness as measured on the Social

Education AFI. Naturally, this information has to be remembered, and this aspect of it is measured by the Digit Span subtest. Thus, even if the other three subtests comprising Verbal I.Q. (Comprehension, Arithmetic and Similarities) do not directly relate to the concept of Community Awareness, half the subtests measure what it (Community Awareness) measures. Therefore, it is not surprising that Verbal I.Q. is its best predictor.

However, both memory and metamemory were also found to correlate highly with Community Awareness. This is reasonable since the information that is acquired about the community has to be remembered. It could also be that both community awareness and the skills of memory and metamemory, are dependent on the skills measured by Verbal I.Q. For this reason, it is recommended that training in verbal skills be an integral part of habilitation programs for the retarded.

5. <u>The Best Predictors of Memory Performance</u>

General Metamemory was seen to be the best predictor of memory performance accounting for a considerable portion (45 per cent) of its variance. A theoretical reason for this result may be attributed to the mediational role of metamemory. As Lawson (1978) had indicated, the spontaneous use of strategies is dependent on intelligence. However, there may be a few mediators between intelligence and memory performance, one of which is general metamemory. Another mediator may be motivation but this aspect will need to be taken up in future studies.

CHAPTER 6

LIMITATIONS OF PRESENT STUDY AND DIRECTIONS FOR FUTURE RESEARCH

One of the more obvious limitations of this study is the limited size of the subject sample. It was difficult to find mentally handicapped adults who were willing to be tested for several hours. The subjects also had to have I.Q. scores in their records or be willing to undergo further testing in order to obtain them. They also had to have scores in adaptive behaviour. All these requirements limited the size of the sample. Future research should be done with larger samples so that the generalizability of the results would have greater validity.

Another weakness of the study was the lack of controls. A control group of normal adults with comparable chronological ages, or a control group of normal children with comparable mental ages would have given more information about individual differences in the areas studied. However the main purpose of this study was to examine metamemory in retarded adults.

In spite of the adaptation of some of the metamemory questions and the experimenter's efforts to explain them clearly, it is still possible that some of the subjects would not have understood the questions fully for reasons

such as lack of interest, lack of attention, anxiety, and/or lack of verbal skills. Complete substitutions for the questions were not made because of the desire to use the original questionnaire of Kreutzer and her colleagues (1975) in its entirety. Only Cavanaugh and Borkowski (1980) had used the complete questionnaire until now. Other researchers (e.g. Eyde and Altman, 1978; Ramayya, 1980; Kurdek and Burt, 1982) have used parts of ths questionnaire both with retarded and non-retarded subjects. Future researchers should attempt to tap the same breadth of metamemory as in the original questionnaire but use such instruments as to ensure that the questions are adequately understood by all the subjects. Further, the questionnaires should also be controlled for both reliability and validity. A more refined definition of metamemory along with a study to identify factors will give this construct greater validity. Consistent results with various populations should help to render the measuring instrument reliable as well.

Certain assumptions about the facility or the difficulty of certain metamemory questions had to be made when deciding upon criteria for scoring. The answers to the questions were categorized in the same way that Kreutzer et al. (1975) and Cavanaugh and Borkowski (1980) had done. However, the former authors did not score the answers and the latter did not indicate specifically how they scored them. Although the scoring system used in this study is valid for the reasons given (see Appendix IV), it is desirable that a

standard system for scoring these questions be devised. Assuming that the system used here is valid, it is still somewhat inadequate for the purpose of computing correlations because of the narrow range between zero and a maximum score of two for certain questions.

This study has broken new ground by including measures of adaptive behaviour in memory research. High correlations were obtained between both memory and metamemory on the one hand, and constructs of adaptive behaviour on the other. Further research along similar lines may help in the understanding of the practical (applied) aspects of memory.

Motivation may well be a factor affecting memory performance even when the learner possesses considerable metamemory knowledge. Controlling for motivation as a variable in future memory research may help the researchers concentrate on the critical variables affecting memory performance.

CHAPTER 7

SUMMARY AND CONCLUSIONS

Mentally retarded adults served as the subjects in this study because they have been relatively neglected in the research literature on memory. The experience of the author has been that memory is relatively poor in this population. Research with mentally retarded children has shown that they perform less well than their non-retarded age peers on memory tasks.

Other studies have shown that both young normal children and older mentally retarded children perform poorly at memory tasks because they do not use memory strategies spontaneously. While different reasons may account for this, Flavell (1971) and Brown (1975) have suggested that the lack of knowledge about memory (metamemory) may be the main reason for the lack of the spontaneous use of mnemonic strategies. One of the main purposes of this study was to test this hypothesis for this population.

It was found that the mentally retarded adults who participated in this study displayed metamemory in all the areas examined, as a group, although some subjects obtained scores of zero in some of the areas of metamemory. The scores were not very high and neither did the different areas

correlate to any great extent with one another.

Although, with one exception, task specific metamemory did not correlate with corresponding memory tests, and the differences within pairs of memory tests did not indicate the influence of corresponding metamemory knowledge on performance (once again with one exception), General Metamemory (the aggregate score for all fourteen metamemory tests) correlated significantly and substantially with the aggregate score for all the memory tests (r=.69). Also, a multiple regression analysis indicated that General Metamemory was a better predictor of memory performance than task specific aspects of it or even I.Q. or Digit Span, accounting for forty five per cent of its variance. Even though a contingency table showed that three of the sixteen subjects scoring above the mean in memory scored below the mean in metamemory, and in spite of the fact that a high correlation does not indicate causality, the theoretical implications of the construct of metamemory makes it likely in a logical sense that metamemory mediates between the executive aspect of intelligence and the rote aspect of memory performance, providing the subject with different options by way of knowledge and strategies for the exercise of his executive control.

As far as practical implications are concerned, the results suggest that the teaching of metamemory in its broader aspect would enhance both memory performance as well as the skills to live independently in mentally retarded adults.

A relevant question is, "How may general metamemory be taught to retarded persons?" Ramayya (1980) had found that practice at memory tasks improved metamemory. Practice would be a good way of increasing metamemory if the learner were capable of reflecting on his actions. Such reflection, however, involves an ability to think abstractly and should not be taken for granted. According to Piaget, children engage in abstract thinking only at a later stage of cognitive development. Since mentally retarded persons often function at lower cognitive levels, and hence, may not reflect on their actions, practice at memorizing alone may not always increase their metamemory.

A more effective method may be to directly encourage the retarded to reflect on their actions and evaluate them. Many of them have had their thinking and their decision-making done for them by parents or institutional staff for several years. They would rarely have been encouraged to to think for themselves. The habit of reflection combined with regular practice in various cognitive activities may prove to be the key to enhancing not only metamemory but other cognitive skills like problem-solving as well.

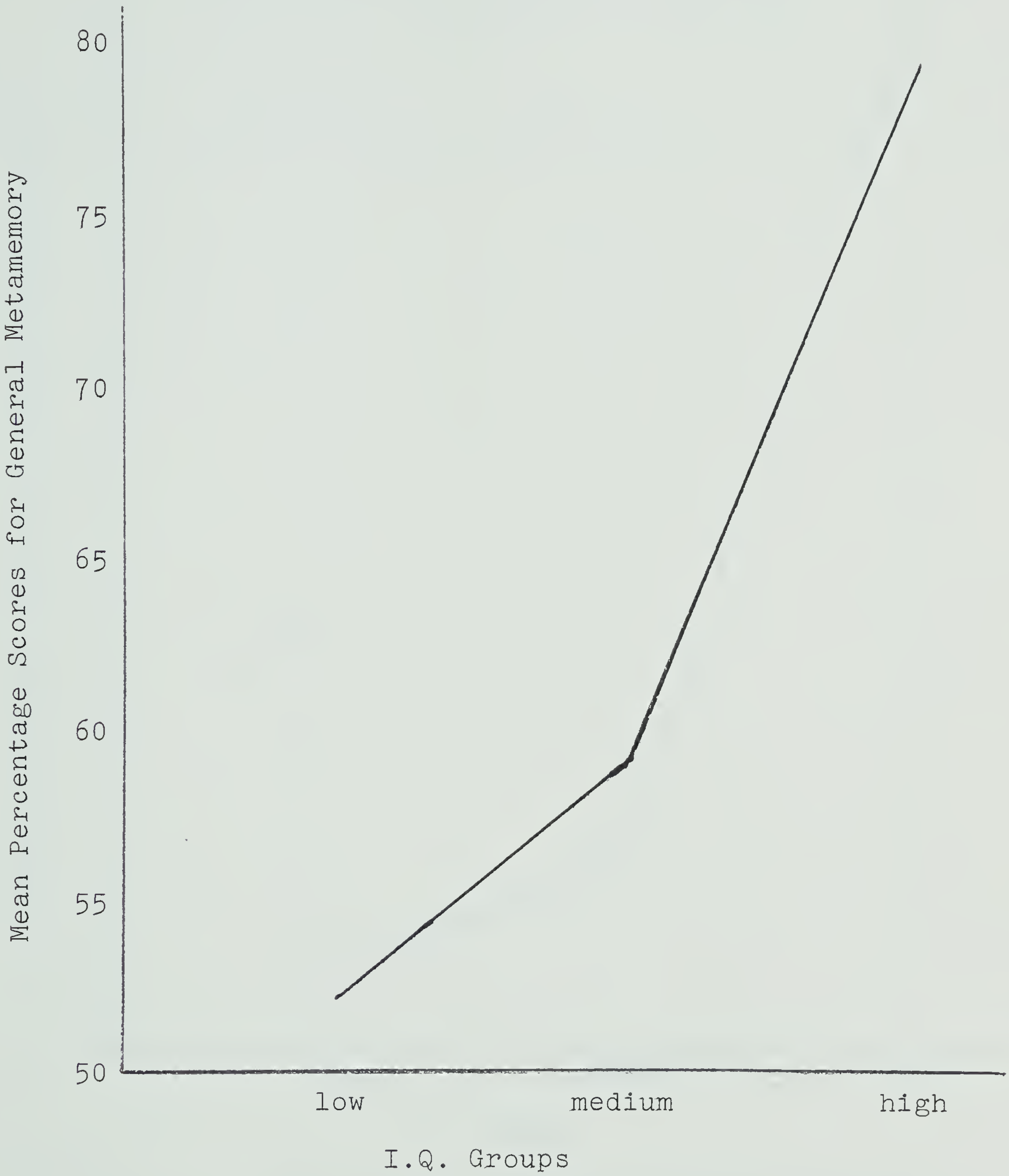

Figure 2: The mean percentage scores for Memory Performance of retarded adults divided into three I.Q. groups

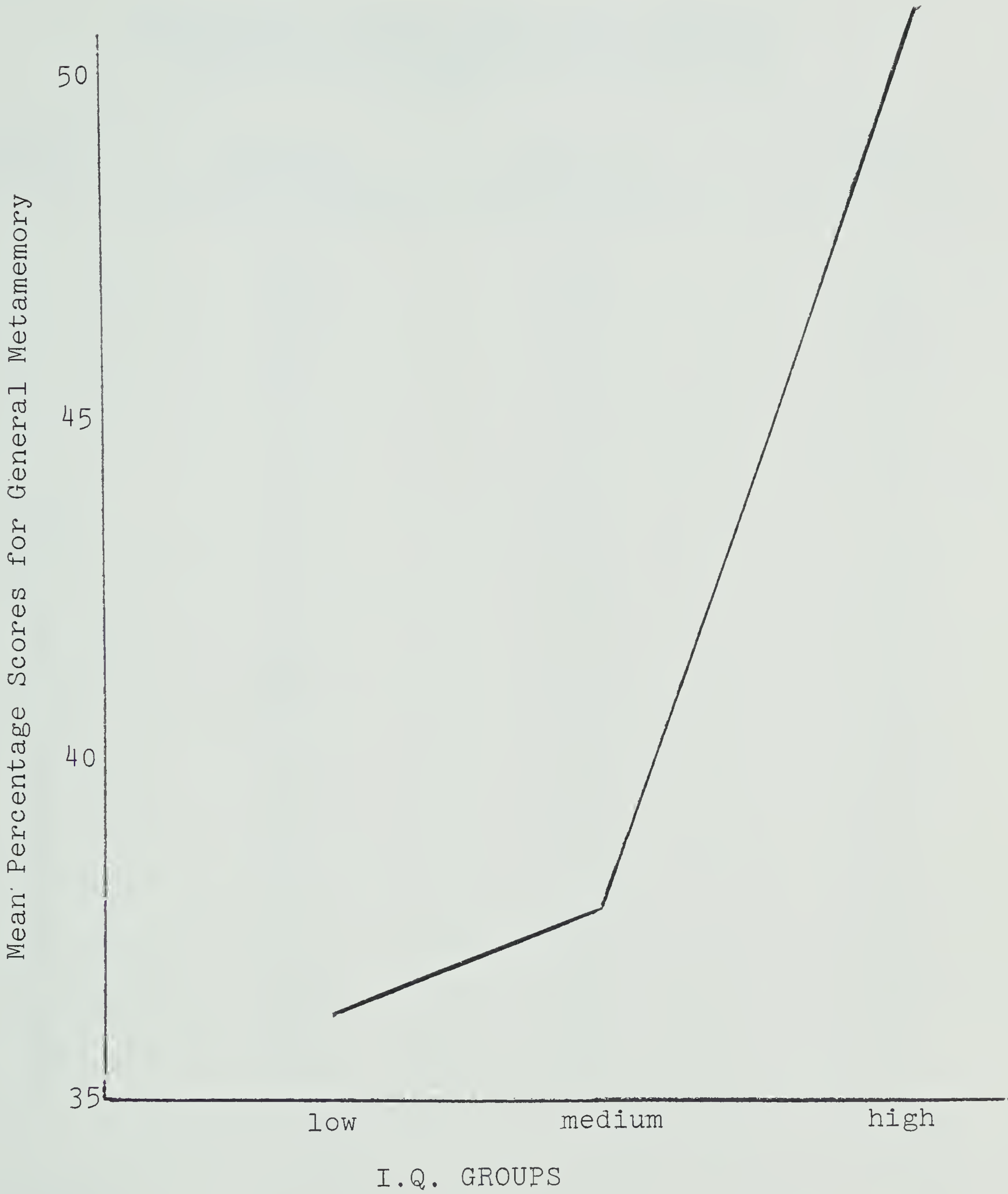

Figure 1: The mean percentage scores for General Metamemory of retarded adults divided into three I.Q. groups

Table 1

Percentage Scores, Means and Standard Deviations for Memory and Metamemory

Subject Number	General Metamemory	Specific Metamemory	Memory Achievement
1	36.5	31.8	53.9
2	33.8	68.2	39.3
3	46.0	68.2	50.6
4	33.8	54.6	68.5
5	32.4	40.9	43.8
6	27.0	45.5	30.3
7	47.3	45.5	46.1
8	47.3	54.6	70.8
9	44.6	54.6	77.5
10	20.3	50.0	47.2
11	25.7	45.5	44.9
12	17.6	31.8	50.6
13	36.5	45.5	59.6
14	43.2	63.6	75.3
15	51.4	72.7	83.2
16	39.2	50.0	66.3
17	48.7	45.5	55.1
18	41.9	54.6	79.8
19	43.2	54.6	29.2
20	29.7	31.8	52.8
21	35.1	50.0	55.1
22	48.7	72.7	85.4
23	31.1	40.9	47.4
24	68.9	77.3	93.3
25	58.1	81.8	80.9
26	59.5	63.6	80.9
27	60.8	72.7	79.8
28	46.0	54.6	84.3
29	44.6	59.1	74.2
30	60.8	86.4	82.0
Mean	41.990	55.620	63.603
Standard Deviation	12.385	14.601	17.696
Max. Raw Score	74	23	96

Table 2

Means and Standard Deviations for the Metamemory Subtests

Metamemory Subtest	Raw Mean	Std. Dev.	% Mean
Memory Awareness	6.200	2.9290	41.33
Savings	0.5000	1.1371	16.66
Immediate/Delay	3.0333	1.3515	75.825
Story-List	1.4667	1.1666	48.89
Coloured/Uncoloured	2.7667	0.4302	69.1675
Opposites/Arbitrary	2.1667	1.0854	54.1675
Study-time	3.7333	1.7407	62.216
Categorized/Uncat.	2.0333	1.0981	67.76
Preparation:Object	2.1000	1.7879	30.0
Preparation:Event	2.3000	1.4179	38.33
Retrieval:Object	2.5667	1.7157	28.518
Retrieval:Event	0.6000	0.8944	12
Retroactive Interf.	0.8000	1.3493	26.66
Rote/Paraphrase	0.7000	0.5960	35

Table 3

Pearson Correlations Between Metamemory Subtests

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Memory Aw.	-													
2. Savings	.09	-												
3. Imm./Delay	.34*	.06	-											
4. Story/List	.00	-.03	-.05	-										
5. Col./Uncol.	.28	-.18	.31*	.09	-									
6. Oppos./Arb.	.10	-.24	.02	-.09	.16	-								
7. Study-Time	.32**	-.03	.12	.06	.33**	.08	-							
8. Study Plan	.03	.23	-.00	.01	-.20	.11	-.14	-						
9. Prep./Obj.	-.14	-.28	.40*	.42*	.26	.17	.14	.02	-					
10. Prep./Ev.	.36*	.03	.64***	.16	.23	.03	.30	.30	.56**	-				
11. Ret./Obj.	.23	.06	-.04	.23	.05	.00	.27	.23	.32*	.31*	-			
12. Ret./Event	.20	-.10	.21	.19	.11	.25	.33*	.26	.50**	.48**	.78***	-		
13. Retro./Inter.	.01	-.07	.38*	.02	-.02	-.09	.09	.40*	.35*	.36*	.07	.27	-	
14. Rote/Para.	.23	.38*	.18	.01	.12	.08	.32*	.49**	.03	.31*	.21	.22	.44**	-

* $p < .05$
** $p < .01$
*** $p < .001$

Table 4

Scores for Memory Subtests with t Scores for Differences Within Subtests

Memory Subtest	N	Raw Mean	Std Dev	% Mean	t Values
With Story	(30)	5.3333	1.6259	76.185	.09
Without Story	(30)	5.3000	1.4420	75.714	
Opposite Pairs	(30)	7.9667	3.3578	66.39	7.29*
Arbitrary Pairs	(30)	3.7333	2.6121	31.11	
One Minute	(30)	5.9333	2.1645	59.33	1.92
Two Minutes	(30)	6.5333	2.1613	65.33	
Coloured	(14)	6.857	1.7484	57.14	.023
Uncoloured	(16)	6.875	2.446	57.29	
Categorized	(16)	12.375	4.0804	68.75	1.39
Uncategorized	(14)	10.214	4.4587	56.74	
Retroactive Interf.	(16)	4.312	1.9236	53.9	.44
No Interference	(14)	4.714	2.9986	58.93	

$^{*}p < .001$

Table 5

Pearson Correlations Between Memory Subtests

	1	2	3	4	5	6	7	8	9
1. Pictures with Story	–								
2. Pictures without Story	.21	–							
3. Coloured/ Uncoloured Pictures	.15	.49**	–						
4. Opposite Pairs	.28	.51**	.23	–					
5. Arbitrary Pairs	.45**	.40*	.31*	.46**	–				
6. One Minute List	.29	.47**	.37*	.28**	.49	–			
7. Two Minute List	.35*	.37*	.45**	.21	.32*	.69***	–		
8. Categorized /Random	.58***	.37*	.40*	.42*	.62***	.49**	.51**	–	
9. Retroactive Interfer- ence	.21	.27	.31*	.43**	.56**	.46**	.45**	.54**	–

* $p < .05$
** $p < .01$
*** $p < .001$

Table 6

Pearson Correlational Coefficients for Some Variables in the Study

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Memory	–													
2. Gen. Meta.	.69***	–												
3. Spec. Met.	.59***	.77***	–											
4. Full Scale IQ	.58***	.49**	.44**	–										
5. Perf. IQ	.43*	.36*	.28	.86***	–									
6. Verb. IQ	.56**	.50**	.48**	.89***	.56**	–								
7. Inform.	.46**	.39*	.34*	.78***	.59***	.78***	–							
8. Compreh.	.55**	.68***	.54**	.62***	.42**	.67***	.61***	–						
9. Vocab.	.40*	.39*	.32*	.69***	.38*	.84***	.61***	.61***	–					
10. Digit Span	.51**	.43**	.43**	.70***	.43**	.78***	.45**	.37*	.56**	–				
11. Pic. Arr.	.57**	.57***	.48**	.73***	.79***	.53**	.61***	.63***	.29	.44**				
12. Digit Symb.	.41*	.40*	.29	.74***	.69***	.64***	.58***	.35*	.45**	.23	.57**	–		
13. Self-Help	.48**	.29	.45**	.30	.18	.35*	.43*	.52**	.12	.14	.23	.30	–	
14. Comm. Aw.	.61**	.60**	.58**	.60**	.37*	.67***	.72***	.80***	.42*	.46*	.56**	.48**	.65***	–

* $p < .05$
** $p < .01$
*** $p < .001$

Table 7

Pearson Correlational Coefficients Between Metamemory and Memory Subtests

	Story	List	Opposite Pairs	Arbit. Pairs	One Minute	Two Minutes
1. Memory Awareness	-.02	.21	.11	.05	.34*	.12
2. Savings	.07	.09	.11	.39*	.10	.24
3. Imm./Delay	.15	-.04	.18	.17	.04	-.19
4. Story/List	.64***	.26	.49*	.47*	.26	.09
5. Col./Uncol.	.12	.06	.11	-.09	.13	.06
6. Opp./Arb.	-.13	.45**	.09	.17	.17	.28
7. Study Time	.30	.18	.19	-.12	.00	-.03
8. Categ./Rand.	.05	.28	.22	.26	.32*	.31*
9. Prep./Obj.	.42*	.20	.35*	.40*	.25	.40*
10. Prep./Ev.	.37*	.12	.23	.19	.38*	.37*
11. Ret./Obj.	.35*	.21	.12	.40*	.50**	.44**
12. Ret./Ev.	.19	.26	.32*	.32*	.43*	.44**
13. Retro. Int.	.16	.03	.21	.24	.05	.27
14. Rote/Para.	.00	.39*	.22	.30	.28	-.00

* $p < .05$
** $p < .01$
*** $p < .001$

Table 8

Contingency Table for High and Low Memory and General Metamemory Scores

	Low General Metamemory	High General Metamemory	
Low Memory	11	3	14
High Memory	3	13	16
	14	16	30

Table 9

Contingency Table for High and Low Memory and Specific Metamemory Scores

	Low Specific Metamemory	High Specific Metamemory	
Low Memory	12	2	14
High Memory	7	9	16
	19	11	30

Table 10

Means and Standard Deviations for General Metamemory and Memory at Three I.Q. Levels

(N = 30)

Source	Mean	Standard Deviation
General Metamemory		
Low I.Q.	36.8999	9.2593
Medium I.Q.	37.7100	10.5542
High I.Q.	51.3599	12.2652
Memory Performance		
Low I.Q.	52.7999	15.0273
Medium I.Q.	59.6799	16.8129
High I.Q.	78.3299	10.6182

Table 11

<u>One-Way Analysis of Variance</u>
<u>General Metamemory by</u>
<u>I.Q. Group</u>

Source	df	Sum of Squares	Mean Squares	F	Probability
Between Groups	2	1320.2386	660.1191	5.698	0.0086
Within Groups	27	3128.0701	115.8544		
Total	29	4448.3086			

Table 12

One-Way Analysis of Variance
Memory Performance by
I.Q. Group

Source	df	Sum of Squares	Mean Squares	F	Probability
Between Groups	2	3489.8144	1744.9070	8.426	0.0014
Within Groups	27	5591.1555	207.0798		
Total	29	9080.9688			

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APPENDIX I

METAMEMORY QUESTIONNAIRE OF KREUTZER, LEONARD AND FLAVELL

APPENDIX I

METAMEMORY QUESTIONNAIRE OF KREUTZER, LEONARD AND FLAVELL

1. Memory Ability

Sometimes I forget things. (1) Do you forget? (2) Do you remember things well - are you a good rememberer? (3) Can you remember better than your friends, or do they remember more than you? For example, if I gave you ten things to look at quickly and remember, and you remembered six of them, how many do you think your friends would remember? (4) Sometimes although a person is a good rememberer, he can still remember some things better than others. Do you remember some kinds of things better than others? (5) Are there some kinds of things that are really hard to remember?

Now I want to come back to a question I asked you at the very beginning. Are there some things that you forget? Are there some kinds of things you find especially hard to remember?

2. Savings

Jim and Bill are in grade ___ (S's own grade). The teacher wanted them to learn the names of all the kinds of birds they might find in the city. Jim had learned them last year and then forgot them. Bill had never learned them before. Do you think one of these boys

would find it easier to learn the names of all the birds? Which one? Why?

3. Immediate - Delay

(1) If you wanted to phone your friend and someone told you the phone number, would it make any difference if you called right away after you heard the number or if you got a drink of water first? (2) Why? (3) What do you do when you want to remember a phone number?

4. Story - List

The other day I showed these pictures to other boys and girls your age. I asked one girl to learn them so that she could tell me what they were later when she couldn't see them any more. And I showed the same pictures to another girl, but also told her a story about the pictures (E put down each picture as its depicted object was mentioned):

> A man gets up out of bed, and gets dressed, putting on his best tie and shoes. Then he sits down at the table for breakfast. After breakfast he takes his dog for a walk. Then he puts on his hat and gets into his car and drives to work.

I told the girl who heard this story that she was supposed to learn the pictures so she could tell me what they were later when she couldn't see the pictures. She didn't have to tell me the story, just the pictures. Do you think the story made it easier or harder for the girl

to remember the pictures? Which girl do you think learned the most? Why?

5. <u>Coloured - Uncoloured - Spacing</u>

You notice that these two sets of pictures are the same except that one is coloured and one is black and white. If I were to ask you to learn these pictures so that when I cover them up you can tell me what the pictures are, would one of these sets be easier for you to learn? Why? (E then spread out the row that had been judged easier, or spread out a randomly selected row if neither had been judged easier). Would this make any difference? Would this set of pictures still be easier? (the same)?

6. <u>Opposite - Arbitrary</u>

I'm going to show you a new way of learning things. I'll show you words in pairs and I'd like you to learn them so that when I show you one of the words you can tell me the other word that goes with it. (Study trials were alternated with test trials on the three practice pairs until S achieved one perfect trial). Here are two longer lists of words that you could learn in the same way. These words are opposites: "boy" goes with "girl", "easy" goes with "hard" (E completes the list in this fashion). And these words are people and things they might do. So "Mary" goes with "walk" (etc.). Do you think one of these would be easier for you to learn? Why?

Let's make believe these blank cards are other ___

(opposites, or people and things they might do, whichever S had judged to be easier to learn). Now suppose I add another (easier item). Now, which is easier to learn, six (easier items) or five (harder items)?

7. Study Time

The other day I asked two children to look at and learn some pictures (gestures at the 20 pictures) because I wanted to see how well they could remember. I asked them how much time they would like to learn the pictures before I would take them away and ask them how many they could remember. One child said one minute. The other child said a longer time, five minutes. (1) Why do you think he wanted as long as five minutes? (2) Which child remembered the most, the one who studied one minute, or the one who studied five minutes? (3) Why? (4) And what would you do, study five minutes or one minute? (5) Why?

8. Study Plan

Now suppose I wanted you to learn these pictures. You could do anything you wanted with the pictures. You might want to move them around, for example. You would have three minutes to look and study, but then I would take the pictures away and ask you what pictures you learned. (1) What would you do to learn these pictures? (2) Did you always learn this way? (3) Did anyone ever

tell you to learn this way? (4) How would a younger child do it? (5) How would you have learned these a year or several years ago? (Frequently, only one or the other of the preceding two questions was asked).

9. Preparation:Object

Suppose you were going ice skating with your friend after school tomorrow and you wnated to be sure to bring your skates. How could you be really certain that you didn't forget to bring your skates along to school in the morning? Can you think of anything else? How many ways can you think of? (In the rare cases when a S said he didn't skate, E posed a formally equivalent problem involving a different object, e.g. a ball).

10. Preparation:Event

What if you were invited to a birthday party for a friend? How could you make sure you remembered his party? Can you think of anything else to do? How many different ways can you think of?

11. Retrieval:Object

Suppose you lost your jacket while you were at school. How would you go about finding it? Anything else you could do? Think of all possible ways.

12. Retrieval:Event

Suppose your friend has a dog and you asked him how old his dog is. He tells you he got his dog as a puppy one

Christmas but can't remember which Christmas. What things could he do to help him remember which Christmas he got his dog? Anything else he could do?

13. Retroactive Interference

One day, two friends went to a birthday party and they met eight children they didn't know before. I'll tell you the names of the children they met: Bill, Fred, Jane, Sally, Anthony, Jim, Lois, and Cindy. After the party one friend went home and the other went to practice a play that he was going to be in. At the play practice he met seven other children he didn't know before, and their names were Sally, Anita, David, Maria, Jim, Dan, and Fred. At dinner that night, both children's parents asked them the names of the children they met at the birthday party that day. Which friend do you think remembered the most, the one who went home after the party, or the one who went to practice in the play where he met some more children? Why?

14. Rote - Paraphrase

The other day I played a record of a story for a girl. I asked her to listen carefully to the record as many times as she wanted so she could tell me the story later. Before she began to listen to the record, she asked me one question: "Am I supposed to remember the story word for word, just like on the record, or can I tell you in my own words?" (1) Why do you think she asked this

question? (2) Would knowing the answer to the question help her know how to study the story? (3) If I told her to study it word for word, what do you suppose she did? (4) If I told her to learn it so she could tell me in her own words, what do you suppose she did? (The order of these last two questions were counterbalanced across Ss at each grade level). (5) Would it be easier to learn it word for word, or in her own words? (6) Why?

APPENDIX II

MATERIALS USED IN THE METAMEMORY QUESTIONS

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MATERIALS USED IN THE METAMEMORY QUESTIONS

Both the pictures and the words were on 10.1 cm. x 15.2 cm. Index Cards and were laminated.

Question Five (Coloured - Uncoloured)

American Flag

Lamp

Clown

Bicycle

Pistol

Wagon

Question Six (Opposites - Arbitrary)

Practice -

apple - orange

fork - knife

cry - sad

Test -

Mary - walk

Charlie - jump

Joe - climb

Anne - sit

boy - girl

hard - easy

cry - laugh

black - white

<u>Question Seven</u> (Study Time)

20 coloured pictures of common objects such as:

Stove

Chair

Fish

Skirt

Drums, etc.

<u>Question Eight</u> (Study Plan)

Hand, foot, ear

Lemon pie, hot dog, red apple

Grey jacket, blue sock, red cap

<u>Question Thirteen</u> (Retroactive Interference)

Party -

Bill

Fred

Jane

Sally

Anthony

Jim

Lois

Cindy

Hockey -

Sally

Anita

David

Maria

Jim

Dan

Fred

APPENDIX III

METHOD OF SCORING METAMEMORY QUESTIONNAIRE AND REASONS FOR DOING SO

APPENDIX III

METHOD OF SCORING METAMEMORY QUESTIONNAIRE AND REASONS FOR DOING SO

The answers were categorized very similarly to the way in which Kreutzer and colleagues categorized them. Instead of computing inter-rater reliability, the two raters listened to the tapes and reached an agreement as to how the answers were to be scored. With the exception of three answers regarding which compromise scores had to be agreed upon, the raters agreed on every answer initially.

In general, a score of three was given for the best answer to each distinct question. Some of the "questions" in Kreutzer et al.'s questionnaire contained more than one distinct question but were grouped together because they were closely related. Easier questions, especially those which involved a choice between only two alternatives, received a maximum score of two.

If the answer included the concept "sometimes" to the questions concerning a subject's ability to remember, forget, or to remember in comparison to friends, a score of three was assigned. Other answers were assigned lower scores as indicated in Appendix IV. No score was assigned to the answer "I do not forget".

Maximum scores were assigned when subjects indicated categories of things or events, or specific instances or objects that they said they remembered or forgot more.

Other answers were scored zero.

Since the Learner vs. Relearner question was a choice between two items, no score was assigned unless a reason was given. Maximum points were given for an answer that included the concept of savings. If a subject came up with a plausible reason as to why a first-time learner would remember more, a score of one was assigned.

Although the question regarding the advantage of dialling a telephone number immediately after it was heard included three choices, the maximum score assigned was two because the question is relatively easy. No special advantage was seen in getting a drink before dialling. Hence, a score of zero was assigned to this answer.

Methods of remembering telephone numbers were also judged to be relatively easy. Therefore, the maximum score was, once again, two. An answer that was neither "rehearse", nor "write down" was scored either two, one or zero, according to its merits.

Although words inserted in a story would seem more memorable, the results of actually testing this sample of subjects indicated that the story did not make any difference to the average score. For this reason, the answer of each subject was compared to his actual performance and scored two if it corresponded and zero if it did not correspond. An additional point was assigned if a suitable reason accompanied the answer. The category "other " was scored according to merit.

Average performance scores for the sample of subjects showed that coloured pictures were not remembered any better or worse than black and white pictures. Since each subject was tested with either coloured or uncoloured pictures in the performance phase, the correspondence of awareness answers to actual performance could not be determined as in the case of the previous question. Hence, two points were given for either answer with an additional point assigned for an adequate reason. One additional point was given to subjects who said that spacing of the pictures did not affect retention.

Subsequent testing indicated that word-pairs which were opposites were remembered much better than word-pairs that had a name coupled with an action. However, certain individuals scored higher on the latter. Two points were assigned if the individual subject's answer corresponded to his performance on the subsequent test. An additional point was given for an adequate justification. If a subject had said that opposites were easier and also that the lengthening of the list did not make the other list easier, he was given another point. If the name-action pair had been chosen by a subject as being easier to remember, then the statement that addition to this list would result in the other list becoming easier at a given stage was scored one point (see Appendix V).

It was presumed that a person who studies an array of pictures for a longer period of time will remember more items. Hence, a score of two was assigned for the choice of

five minutes for better retention. If an adequate justification for the choice was also furnished, another point was added. However, when the subject was asked whether he will need a longer or shorter period of time to study an array of pictures, he was assigned a score of two if his answer corresponded to his actual performance on a subsequent test involving two arrays which he studied for one minute and two minutes respectively. If an adequate justification accompanied the answer, another point was added.

When the subjects were invited to do what they wanted with an array of pictures, in order to remember them, they were scored as indicated in Appendix IV.

For the "Preparation:Object" metamemory test, the subject was given two points if he used the skates themselves or a note as reminder, and an additional point for more of the same kind. Asking others to remind one was seen as a lesser mnemonic strategy. Hence, this was assigned only one point. The scoring for "Preparation:Event" was similar (see Appendix IV).

In retrieving a lost object, a score of nine was given for a series of strategies indicating an exhaustive search. Of the individual strategies, "retracing steps" was scored higher than the others because it implied a plan.

When trying to remember an event, an active, elaborate memory search was scored more than the other individual strategies because it was systematic. An exhaustive search

would have scored five.

Since the question monitoring awareness of retroactive interference had only two choices, it was scored only in the presence of an adequate justification. The maximum score was three because an adequate justification would have indicated considerable mnemonic awareness.

The rote vs. paraphrase question was assumed to be relatively easy and was assigned a maximum score of two.

It is difficult ot assess whether or not the method of scoring was objectively fair. It was agreed upon after consultation with five or six persons familiar with the field of study. Allowance will have to be made for a possible lack of proportion in the distribution of points. Further allowance will have to be made for the possible lack of understanding of the questions by some of the subjects. It is also possible that many mentally handicapped persons have their own methods of conceptualizing and handling memory tests which the ordinary researcher has a hard time understanding.

APPENDIX IV

DETAILED SCORING OF METAMEMORY QUESTIONNAIRE

APPENDIX IV

DETAILED SCORING OF METAMEMORY QUESTIONNAIRE

Question One

Forgets	2
Forgets sometimes	3
Does not forget	0
Remembers well	1
Remembers well sometimes	3
Does not remember well	2
Remembers better than friends	1
Remembers less well than friends	1
Remembers sometimes better, sometimes worse than friends	3
Remembers same as friends	2
Easier remembering categories	3
Easier remembering instances	3
Non-specific or nothing easier	0
Harder remembering categories	3
Harder remembering instances	3
Non-specific or nothing harder	0

Question Two

Relearner remembers better than first-time learner	3
First-time learner remembers better (without reason)	0
First-time learner remembers better (with reason)	1

Same	0
None	0

Question Three

Phone first	2
Drink first	0
Same (with reason)	1
Write down	2
Rehearse	1
Other or none	0

Question Four

Words embedded in story easier AND corresponding recall	2
Words in list easier AND corresponding recall	2
Justification	1

Question Five

Coloured pictures easier with corresponding recall	2
Uncoloured pictures easier with corresponding recall	2
Justification	1
No effect of spacing	1
Spacing has effect	0

Question Six

Opposite pairs easier	2
Arbitrary pairs easier	0
Arbitrary pairs easier with corresponding recall	2
Justification	1

Opposite pairs always easier	1

Question Seven

Longer study time results in better recall (in general)	2
Shorter study time results in better recall (in general)	0
Adequate justification	1
Longer study time better with corresponding recall	2
Shorter study time better with corresponding recall	2
With justification	1

Question Eight

Categorized	3
Associated	2
Rehearsed	1
Looked only	1
Random rearrangement	0

Question Nine

Skates (two things)	3
Skates (one thing)	2
One note	2
Two notes	3
Others	1
Self	0
No preparation	0

Question Ten

One note	2
Two notes	3
Three notes	4
Others	1
Two others	2
Self	0
No preparation	0

Question Eleven

Try and remember	0
One likely place	1
Two likely places	2
One lost and found	1
Two lost and found	2
Retrace steps	2
Ask another to search	1
Ask another whether it was seen	1
Ask two others whether it was seen	2

Question Twelve

Improbable note	0
Plausible note	1
Size of dog	1
Others	1
Self (passive)	0
Self (active and elaborate)	2
Self (active but not elaborate)	1

Indirect	1

Question Thirteen

Straight home (with justification)	3
Straight home (without justification)	0
Hockey (with justification)	1
Hockey (without justification)	0

Question Fourteen

Own words easier with justification	2
Own words easier without justification	1
Exact words easier	0

APPENDIX V

MATERIALS USED FOR THE MEMORY TESTS

APPENDIX V

MATERIALS USED FOR THE MEMORY TESTS

1. Story/List

Each list of seven pictures was used with or without a story. The stories are given below with the pictures underlined.

There was a man who liked to canoe. He had a beautiful wife who wore beautiful clothes. They lived in an old mill near a lake that turned gold when the sun set. They often went boating with their friends on the lake and caught fish. They made very tasty meals with it.

There was once a circus clown who performed in a circus. He had a blond wife and a small son. They lived in a tree-house beside a waterfall. The son was learning to play the violin. The husband had a new rifle and he shot moose with it.

2. Coloured/Uncoloured

Black and white photocopies of the coloured pictures were used with half the subjects. The pictures were:

horses

books

gloves

fireplace

television set

goose

easter eggs

dishwasher

refrigerator

windmill

rabbit

purses

3. <u>Opposite Pairs/Arbitrary Pairs</u>

ugly - beautiful	Anne - sit
boy - girl	John - swim
black - white	Mary - walk
big - small	Bob - smoke
fat - thin	Charlie - jump
short - tall	Linda - skate
cry - laugh	Wanda - sneeze
good - bad	Wayne - run
coloured - uncoloured	Frank - sing
stingy - generous	Bruce - talk
smooth - rough	Joe - climb
hard - easy (soft)	Richard - ride

4. <u>Study Time</u>

The two lists were marched for content. One-half of the subjects studied one of the lists for one minute and the other list for two minutes. The pictures were:

orange juice	coffee

Christmas wreath	Christmas tree
ham	roast
drapes	rugs
watches	clocks
truck	bicycle
dog	cat
vacuum cleaner	stove
shirt	pants
grapes	strawberries

5. <u>Study Plan</u>

The pictures were categorized and presented to one-half of the subjects. The other half of the subjects were shown the same pictures but in random order. The pictures were:

chair	stool	bed
shirt	blouse	pants
cookies	hamburger	pie
ear	foot	hand
car	boat	train
bear	dog	rabbit

6. <u>Retroactive Interference</u>

The names mentioned in the question were presented in the form of pictures of persons. The pictures were cut out of fashion catalogues. The names were:

<u>party</u>	<u>hockey</u>
Bill	Sally
Fred	Anita

Jane	David
Sally	Maria
Anthony	Jim
Jim	Dan
Lois	Fred
Cindy	

APPENDIX VI

MEASURES OF ADAPTIVE BEHAVIOR

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MEASURES OF ADAPTIVE BEHAVIOR

1. The measure, COMMUNITY AWARENESS, was taken from the Adaptive Functioning Index, Social-Education Test (Nancy Marlett, 1971).

Community Awareness

a. General Information (1-9):

REFER TO THE APPLICATION FORM AND GIVE CREDIT FOR:

(1) Address

(2) School grade reached

(3) Whom to notify in case of accident

ASK THE TRAINEE:

(4) "Who would you phone if you had a problem with your mail delivery?"

(5) "What is the name of one newspaper?"

GIVE THE TESTEE THE FOUR SHAPES

(6) "Which shape is used in 'YIELD' signs?"

(7) "If you went to visit a friend in a strange city and could not find the house, what would you do?"

(8) "Tell me the name of one industry."

(9) What place of interest would you take a new friend to see?"

b. Community Costs (10-13):

(10) "How much does a stamp cost to mail a local letter?"

(11) "How much do most downtown shows cost?"

(12) "How much does it cost to ride a local bus?" (if in country, "bus to town")

(13) How much does a loaf of bread cost?"

c. <u>Work Related Information (14-20)</u>:

(14) GIVE CREDIT IF "JOBS" SECTION OF THE APPLICATION FORM IS COMPLETED CORRECTLY.

(15) "What is the minimum wage per hour?"

(16) "What does a foreman do?"

(17) "How do you find a job?"

(18) "What is a labour union?"

(19) "What is insurance?"

(20) "Name two deductions from a pay cheque."

2. The construct, NEATNESS is comprised of the areas cleanliness, appearance and room management, as defined by the Adaptive Functioning Index: Residential Check List (Nancy Marlett, 1971). A measure was obtained by dividing the aggregate score by three.

CLEANLINESS	Week: 1	2	3	4	5
1. Washes hands and face as needed - *after toilet, before meals.*					
2. Washes all over when bathing or showering.					
3. Bathes or showers when needed.					
4. Avoids body odours - *washes, uses deodorant, foot powder, etc.*					
5. Keeps hair combed.					
6. Washes hair regularly and properly.					
7. Brushes teeth properly and regularly.					
8. Cleans and clips nails; keeps ears clean.					
9. Covers mouth when coughing or sneezing and uses a handkerchief.					
10. For ladies: feminine hygiene, shaves under-arms and legs if needed. For men: shaves as needed.					
Total					

APPEARANCE (1-5) AND EATING (6-10)

1. Has good posture - *sits, stands without slouching or sprawling; walks with an easy stride.*
2. Dresses himself neatly - *shirt tucked in; buttons, zippers fastened.*
3. Changes underwear and clothing regularly (always after bath).
4. Wears the right kind of clothes for the occasion, and the weather.
5. Clothes "go together" - *patterns, colours and/or accessories don't clash.*
6. Eats main meal with a fork.
7. Chews food with mouth closed, and does not speak with mouth full or make loud noises.
8. Eats and drinks without spilling, and keeps himself and his food on his own space.
9. Uses knife for cutting, spoon for soups/puddings.
10. Eats as part of a group - *talks table talk, passes salt, waits till others are finished to leave.*

Total

ROOM MANAGEMENT

1. When undressing separates dirty from clean clothes - *puts clean clothes away and dirty clothes in a laundry bag.*
2. Can find his clothes in his drawers - *drawers are relatively tidy.*
3. Makes his bed neatly.
4. Keeps room tidy/or accepts sharing of responsibility of room cleaning.
5. Cleans wash basin and bath tub (shower) after use.
6. Takes care of his own keys, towels, sheets.
7. Tidies up - *keeps things in proper places, uses and cleans ashtrays, throws out newspapers.*
8. Cleans regularly - *dusts, sweeps, etc.*
9. Does laundry - *operates machine, uses soap, separates whites and colours that run.*
10. Keeps clothes in good condition - *ironing, mending; takes clothes to dry cleaners.*

Total

3. The construct, SELF-HELP SKILLS is comprised of the areas Trnasportation, Shopping and Cooking as defined by the Adaptive Functioning Index: Residential Check List (Nancy Marlett, 1971). A measure was obtained by dividing the aggregate score by three.

TRANSPORTATION	Weeks: 1	2	3	4	5
1. Is familiar with the neighbourhood and the services available.					
2. Observes pedestrian signs and traffic rules.					
3. Travels with someone on the bus.					
4. Obtains bus tickets or exact fare.					
5. Uses bus for short trips - *can take bus and return by himself.*					
6. Transfers to another bus line when necessary.					
7. Goes by bus to at least 5 places of interest in the community - *church, stores, recreation facilities.*					
8. Behaves appropriately when riding on bus - *asks for directions politely, pays money, finds a seat quickly.*					
9. Can explain use of other modes of transportation - *train, taxi, plane.*					
10. Gets to a place not previously visited by using public transportation - *phones bus depot for routes to new place, uses route map, etc.*					
Total					

SHOPPING					
1. Can get assistance from clerk in store.					
2. Buys daily things like coffee, newspaper, toothpaste, nylons.					
3. Knows when he has enough money to buy something new.					
4. Knows when to expect change and/or when he has about the right change back.					
5. Finds his way around a department store.					
6. Can handle check out lines - *can join and stay in line, has money ready and pays cashier after the goods have been rung up.*					
7. Behaves appropriately in restaurant or cafeteria - *is able to quickly, quietly find a seat, polite to waitress, etc.*					
8. Can order and pay for a meal on his own.					
9. Buys his own clothes - *coat, shoes, etc.;* and understands labels with size, price and laundry information.					
10. Takes clothes or appliances - *shoes, radio, etc.* - in for repair.					
Total					

COOKING (1-5) AND HOME MANAGEMENT (6-10)

1. Prepares his own breakfast or lunch (sandwiches, etc.).					
2. Helps with food preparation - *setting table, washing dishes, taking out garbage.*					
3. Prepares a variety of simple, nutritious meals.					
4. Stores groceries, linens, etc. efficiently in storage space - *food away from heat, cleaning supplies together, etc.*					
5. Uses a simple cookbook.					
6. Knows the instructions on household labels - *poison, mix with water, etc.*					
7. Takes an interest in how the house/room looks - *finds posters or plants, arranges furniture.*					
8. Does major cleaning - *floors, windows, stove and refrigerator.*					
9. Entertains for an evening - *serves a meal or snacks, suggests cards or activity, offers refreshments and refills.*					
10. Takes charge of home/apartment when necessary for extended periods of time.					
Total					

4. The construct, PERSONAL SKILLS is comprised of the areas Consideration, Leisure, Getting Friends, Keeping Friends and Handling Problems as defined by the Adaptive Functioning Index. Residential Check List (Nancy Marlett, 1971). A measure was obtained by dividing the aggregate score by give.

CONSIDERATION

1. Is polite - *uses "please", "thank you", "pardon me", "I'm sorry".*					
2. Is quiet when someone is sleeping or busy.					
3. Listens when someone is talking to him; doesn't butt in.					
4. Looks at people when talking to them.					
5. Doesn't borrow things without asking.					
6. Returns things to the proper place or owner after the agreed loan time.					
7. Doesn't "bully" others.					
8. Kind to people - doesn't make fun of them.					
9. Shares things but sets limits - *doesn't give all his money away.*					
10. Let's those he lives with know where he is going or when guests are coming.					
Total					

LEISURE

1. Takes part in planned/supervised leisure.
2. Does casual things that don't require much planning with a friend(s) - *coffee, going for a walk, playing cards, etc.*
3. Plans outings occasionally with friends - *show, zoo, cabaret.*
4. Does things by himself - *T.V., hobbies.*

GETTING FRIENDS

1. Smiles at and greets people he recognizes.
2. Calls people he knows by name.
3. Sits with someone at coffee/meals, or on bus.
4. Waits for or meets someone for coffee/meals, or on the bus.
5. Takes his turn in group duties.
6. Carries on short conversations about things that are of interest to others - *sports, T.V. shows, weather.*
7. Offers help when someone is sick, upset, or having trouble doing something.
8. Makes his own friends - doesn't rely on staff, volunteers, family, etc.
9. Friendly with people of both sexes.
10. Finds a way to introduce himself to someone he wants to know.

Total

KEEPING FRIENDS

1. Does things for himself - *doesn't expect others to wait on him.*
2. When he has offended someone, apologizes and tries not to do it again.
3. Doesn't take things too seriously or over-react.
4. Works out a compromise with a friend; doesn't always expect to have his own way.
5. Remembers special days or interests of friends.
6. Can take a hint (cue) when someone wants to leave, or wants him to leave.
7. Shows affection without embarrassing others.
8. Keeps in touch with a friend - *drops by at night, telephones.*
9. Doesn't expect more of friends than they can give - *constant companionship, marriage.*
10. If necessary, breaks friendships without becoming enemies.

Total

HANDLING PROBLEMS

1. Knows what happens when he does well or when rules are broken.					
2. Talks about things as they really are - doesn't change them around or blow them up.					
3. Deals with one part of a problem at a time.					
4. Can work through a decision given two choices - *which skill to work on next, whether to go to the show or wrestling.*					
5. When plans fall through, has other alternatives.					
6. Learns from his errors; doesn't keep making the same mistake.					
7. Tries hard to do well.					
8. Doesn't give up easily.					
9. Accepts responsibility for his decisions - *tries not to blame others, or use sickness/handicaps as an excuse for being late, not doing duties, etc.*					
10. Works out his own solutions to problems - *writing things down if his memory is poor.*					
Total					

APPENDIX VII

COMPONENTS OF PERSONAL COMPETENCE ACCORDING TO GREENSPAN, 1979

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